# Annual Report 1988-89

Cancer Control Agency of British Columbia

British Columbia Cancer Research Centre

British Columbia Cancer Foundation

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# Cancer Control Agency of British Columbia

## Administration

**Dr. D.J. Klaassen**
Director, CCABC

**Mr. B.T. Schmidt**
Deputy Director and Chief Operating Officer

**Mr. D.C. Richardson**
Assistant Deputy Director

**Mrs. L.B. Jamieson**
Assistant Deputy Director of Nursing and Related Patient Care Services

**Dr. D. Osoba**
Head, Communities Oncology Program

**Dr. P. Coy**
Director, Victoria Cancer Clinic

**Mr. P. McAllister**
Administrator, Victoria Cancer Clinic

## Board of Trustees

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**Mrs. Jane van Roggen**
Vice-President

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**Dr. Randall N. Fairey**

**Mrs. Barbara Greenlaw**

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**Finance Committee**
Mr. B.M. Philp

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**Nominating Committee**
Mr. L. Jolivet

**Professional Advisory Committee**
Dr. R.N. Fairey

**Quality of Care Committee**
Dr. M.D. Low

**Ad Hoc Committee on Additional Cancer Facilities**
Dr. R.N. Fairey

**Ad Hoc Committee on Board Appraisal**
Ms. L. Messer

*Ministerial Committees*

**Joint Agency/Ministry Cancer Outreach Program Committee**
Mr. J. Cheung

# President's Report

Dear Mr. Minister:



The Board of Trustees of the Cancer Control Agency of British Columbia is pleased to report upon a year of challenge and accomplishment.

In March 1987 this Board instigated a long-range, policy-oriented inquiry into the cancer treatment needs of this province. Many constituencies, including representatives from the British Columbia Medical Association, the University of British Columbia, our medical, scientific, professional, nursing and administrative staff, as well as representatives from your Ministry, participated in this process. During the past two years we have assessed critically our strengths and weaknesses. We have looked at our organizational structure and resource allocation and our role as educators of professional care givers to our patients and to the community that we serve. Cancer research and cancer prevention, as well as our funding and resource acquisition and our community profile have all been subjected to critical analysis. It is with a decided sense of accomplishment that we have evolved a new strategic plan as the basis for implementing change and providing new directions for cancer services in this province.

A committee of this Board produced a document dealing with planning for additional cancer facilities and the expansion of cancer services in British Columbia. This important report projects a 56% increase in the number of cancer patients in British Columbia between 1986 and 2001. This is our greatest challenge! It notes clearly that present treatment facilities cannot provide optimal levels of cancer care into the 1990s. Major expansion and program change will be required. This problem is one of such magnitude that the shortage in radiation therapy and, to a lesser extent, chemotherapy services, can become a public health crisis. The Board has submitted this report and its recommendations to your government. The temporary introduction of night shift radiotherapy services at the Vancouver Cancer Centre has to date stabilized but not reduced our waiting list. We respectfully suggest that this situation calls for the highest priority on the part of both the Ministry of Health and the CCABC.

The Board of Trustees' subcommittee on quality assurance is aggressive and probing. It is our belief that in all aspects of patient care we surpass the essential standards. No other area of the health care field is as subjected to the continual and rapid change and improvement in medical procedures, treatments and cure as is cancer medicine. There are available new techniques and equipment. Our mandate is to provide a comprehensive cancer control program for the citizens of this province. We are determined to stay on the leading edge. Our achievements in cancer prevention, cancer epidemiology and cancer treatment have established the Cancer Control Agency as an international centre of excellence. These successes are due to the high calibre of our medical, scientific, nursing and professional staff.

It is with pleasure that I report to you that the Alberta Cancer Board and the Board of the Cancer Control Agency held a first ever joint meeting. This occasion was the first time that two provincial cancer boards have come together to explore areas of mutual concern and cooperation. There is a sense of excitement and hope that further planning on a cooperative basis will improve many areas of the cancer programs of both provinces.

The cancer program in this province continues to expand to meet the rising numbers of cancer patients. Medical therapy is becoming increasingly complex and intensive. The demands and indications for radiation and chemotherapy are increasing in excess of the growth in patient numbers. To meet these demands more financial resources are required. This Board struggled through the past year under the burden of a major financial deficit. With the help of your government, with scrupulous attention to cost-cutting and with reduction in planned programs we ended our fiscal year with a nearly balanced budget. It is increasingly difficult to balance our budget and still meet the demands on us for services and maintain the high quality of our programs.

Even with the close partnership which exists between your Ministry and this Agency, we are no longer able to make the necessary program improvements without major funds for capital equipment. This Board of Trustees, ably supported by the British Columbia Cancer Foundation, has spent months planning and organizing a fund-raising campaign to raise $5 million which will enable us to take creative advantage of the new opportunities in cancer medicine.

The Board is especially proud of the way staff have coped with the large numbers of new patients and maintained a high standard of care. The medical staff has, in addition, compiled an updated cancer treatment policies manual. The standardization of cancer treatment services for the British Columbia geopolitical area is an accomplishment achieved nowhere else in Canada and our medical staff is greatly envied for it. The Cancer Control Agency's breast tumour group, the B.C. Radiological Society, the B.C. Medical Association and your Ministry have guided Canada's first-ever pilot project for the early detection of breast cancer. Physicians and scientists from this Agency continue to be asked to speak of our work here and to have the results of research activities published in prestigious medical publications. During the year many were given leadership roles in national and international organizations. Mr. Brian Schmidt was recruited as deputy director and chief operating officer in July 1988. He has already made a significant and energetic impact on the administration of the Agency.

The Board of Trustees brings to your attention that the Agency is an educational organization. We are responsible for the training of radiation and cytopathology technologists. We share teaching responsibilities for undergraduate and postgraduate medical education. We assist in the education of nursing, nutrition and pastoral students. Many of our staff shoulder these teaching loads and their success is a matter of pride. The Cancer Control Agency collaborates with the Canadian Cancer Society for many aspects of public education. The Agency outreach program which is much emulated outside this province has been renamed the Communities Oncology Program. The new name better reflects the relationship of the Agency and the communities of the province. This unique program was pioneered by Dr. Richard Beck who retired this year after 40 years of dedicated care to cancer patients in B.C. Dr. David Osoba has accepted this important portfolio.

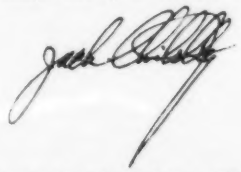
All members of this Board of Trustees are involved in the many committees necessary to cope with the needs of our complex cancer service. For the first time we have, in addition to those usual committees, instituted and involved ourselves in a board self-appraisal which proved to be a useful and revealing exercise. This Board has also taken seriously its role of formally appraising the senior administrative staff.

Cancer service in British Columbia would be significantly diminished were it not for a phalanx of volunteer support people. In addition to help from the British Columbia Cancer Foundation and our B.C. and Yukon Division of the Canadian Cancer Society, we rely on the Women's Auxiliary, the Order of the Eastern Star and the IODE to accomplish our mandate. I take this opportunity to thank all these groups and bring to your attention their invaluable assistance.

An event of special note was the awarding of the Order of Canada to Robert Noble, MD, PhD, DSc, FRSC, Professor Emeritus (Physiology). An internationally recognized scientist, Dr. Noble still works part-time in our Cancer Endocrinology unit. This award is in recognition of his research work in developing and testing early chemotherapy drugs and his many contributions to cancer endocrinology.

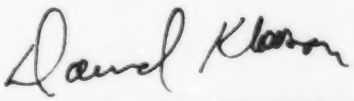
The Board of Trustees of the Cancer Control Agency of British Columbia appreciate the high expectations of the enormous challenge presented to them. They remain committed and are privileged to serve on this Board.

Respectfully submitted,



**Jack H. Chritchley, MD, MSc, FRCPC**

President and Chairman, Board of Trustees



**David J. Klaassen, MD, FRCPC**

Director

# Volunteer Organizations



## IODE

As Chairman of the IODE Jessie R. Burke (Memorial) Cancer and Research Fund Committee, it is my pleasure to present this report to the Cancer Control Agency of British Columbia. During 1988 IODE members volunteered over 1400 hours of service at the coffee bar on the first floor of the A. Maxwell Evans Clinic and received more than $1,600 in donations. This money along with coffee bar funds was used to buy new furnishings for the chemotherapy waiting room. In May 1988 a Lymphapress machine was donated by the Provincial Chapter of B.C. to the Physiotherapy Department and in December, we presented a second Lymphapress to this department. Because we bought the second machine from Chrysalis Medical Services, they donated a bridging unit which allows two patients to receive treatment from one machine. I have met with the Assistant Deputy Director of Nursing and Related Patient Care Services, Bonnie Jamieson, to discuss ways our members can continue to provide comfort and service to patients at the Vancouver and Victoria Clinics.

**Moira Murdoch**
Chairman
Jessie R. Burke (Memorial)
Cancer and Research Fund

## Order of the Eastern Star

It is a pleasure to present the report of the Order of the Eastern Star in British Columbia and the Yukon. We have 69 stations and sub-stations where cancer dressings are made and distributed free of charge to cancer patients (under medical authority). Our organization holds teas, bazaars and other social activities to support the purchasing of materials for these dressings. We also supply finger puppets for children having blood work and stoma bibs and some head scarves for patients after chemotherapy. Our Worthy Grand Matron, Mrs. Myrtle Tucker, has chosen as her provincial project the supplying of Beckman tabletop centrifuges for the Terry Fox Laboratory.

Donations are being received for this needed equipment until the end of May 1989. At the November 1988 Triennial Session of the O.E.S. held in Atlanta, Georgia fifteen countries were represented. British Columbia was recognized as being second in the world for their support to cancer research and dressings, second only to California whose membership exceeds 102,000 compared to B.C. and Yukon where total membership is 9,500. The projects for research approved at the 1988 O.E.S. Grand Chapter Session are shown in the table above.

Our thanks go to Dr. D.J. Klaassen, Director of the Cancer Control Agency of B.C. and Mrs. Bonnie Jamieson, Assistant Deputy Director of Nursing and Related Patient Care Services, for compiling suggestions for these projects for the approval of our Grand Chapter and for their encouragement that all departments submit their needs.

**Mrs. Lillean Musgrave**
Director of Cancer Activities
Order of the Eastern Star

### Order of the Eastern Star - Designated Gifts, 1988-89

| | | |
|---|---|---|
| 1. **Shane Fellowship** (3 months) | $ 7,000 | Dr. M. Mildenberger |
| 2. **Terry Fox Laboratory** | 21,000 | Level III/Gene Transfer Laboratory |
| 3. **Radiotherapy Department** | 3,360 | Techlum 2000 treatment stretcher |
| 4. **Medical Illustration Department** | 4,200 | Video camera recorder and character generator for video camera |
| 5. **Prosthetics Department** | 621 | Jeweller's lathe and 3-jaw chuck |
| 6. **Ambulatory Care Unit** | 1,800 | Two chemotherapy chairs |
| 7. **5 West** (Isolation) | 4,163 | Ice-O-Matic flaker and water dispenser |
| 8. **Radiation Oncology** | 14,590 | Olympus gastroscope |
| 9. **Irma Boyce Library** | 1,500 | |
| **Total** | **$ 58,234** | |

# Committees of the Cancer Control Agency and Their Chairmen

*Tumour Group Committees*

**Bone & Soft Tissue Tumour Group**
Dr. K.S. Morton

**Breast Tumour Group**
Dr. V.E. Basco

**Central Nervous System Tumour Group**
Dr. C.M. Ludgate

**Gastro-Intestinal Tumour Group**
Dr. W.C. MacDonald

**Genito-Urinary Tumour Group**
Dr. L.D. Sullivan

**Head & Neck Tumour Group**
Dr. A.D. Flores

**Lung Tumour Group**
Drs. W. Nelems & P. Coy

**Lymphoma & Leukemia Tumour Group**
Dr. J.M. Connors

**Melanoma Tumour Group**
Dr. H.K.B. Silver

**Ocular & Orbital Tumour Group**
Dr. J. Rootman

**Pediatric Tumour Group**
Dr. C.J.H. Fryer

**Skin Tumour Group**
Dr. D.I. McLean

*Medical/Administrative Committees*

**Agency Management Committee**
Dr. D.J. Klaassen

**Bone Marrow Transplant Committee**
Dr. G.L. Phillips

**Cancer Prevention Advisory Committee**
Dr. P.R. Band

**Clinical Investigations Committee**
Dr. J.M. Connors

**Management Advisory Group**
P. Hayles

**Medical Manpower Committee**
Dr. D.J. Klaassen

**Medical Records Committee**
Dr. J.H. Hay

**Nutrition Committee**
Dr. W.C. MacDonald

**Pharmacy and Therapeutics Committee**
Dr. I.H. Plenderleith

**Professional Advisory Credentials Committee**
Dr. G.H. Anderson

**Symptom Management Committee**
Dr. I.H. Plenderleith

*A. Maxwell Evans Clinic*

**Acquired Immune Deficiency Syndrome Committee**
Dr. J.H. Goldie

**Biohazards Committee**
Dr. P.S. Rennie

**Infection Control Committee**
Dr. R.N. Murray

**Occupational Health & Safety Committee**
L. Svirchev

**OR Committee**
Dr. R.E. Robins

**Patient Care Committee**
Drs. J.H. Goldie & S.M. Jackson

**Radiation Safety Committee**
D.C. Richardson

**Research Management Committee**
Dr. D.J. Klaassen

**Staff Communications Committee**
R. Bruce

*Victoria Cancer Clinic*

**Department Heads**
P. McAllister

**Health Records**
Dr. P. Coy

**Medical Oncology**
Dr. K.S. Wilson

**Medical Staff**
Dr. P. Coy

**Occupational Health and Safety**
Ms. H. Chamberlain

**Patient Care**
Dr. P. Coy

**Quality Assurance**
Dr. P. Coy

**Radiation Therapy**
Dr. S. Alexander

**Radiotherapy Strategy Committee**
Dr. S. Alexander

## Division Heads

**Clinical Pathology**
Dr. A.J. Worth

**Cytology Pathology**
Dr. G.H. Anderson

**Dentistry**
Dr. P. Stevenson-Moore

**Dermatologic Oncology**
Dr. D.I. McLean

**Diagnostic Imaging**
Dr. H.A. Mueller

**Epidemiology, Biometry and Occupational Oncology**
Dr. P.R. Band

**Gynecologic Oncology**
Dr. J.L. Benedet

**Medical Oncology**
Dr. J.H. Goldie

**Pediatric Oncology**
Dr. C.J.H. Fryer

**Pharmacy**
Ms. L. Chow

**Radiation Oncology**
Dr. S.M. Jackson

**Radiation Physics**
Dr. R.O. Kornelsen

**Surgical Oncology**
Dr. R.E. Robins

**Social Work**
Mr. R. Doll

**Terry Fox Laboratory**
Dr. A.C. Eaves

## Section Heads

**Advanced Therapeutics**
Dr. H.K.B. Silver

**Cancer Endocrinology**
Dr. N. Bruchovsky

**Developmental Radiotherapy**
Dr. G.B. Goodman

## Department Heads

*A. Maxwell Evans Clinic*

**Admitting**
A. Hudson

**Ambulatory Care**
C. Brown

**Chaplaincy**
Rev. C. Johnstone

**Clinical Laboratory**
A. Basi

**Cytology Laboratory**
O. Bennett

**Data Services**
P. Hayles

**Diagnostic Imaging**
E. Kilby

**Distribution Services**
D. Sawyer

**Employee Relations**
R. Bruce

**Finance**
D. Morrison

**Health Records**
L. Christian

**Hospital 5 West**
H. Mielcarski

**Hospital 5 East**
B. Korabek

**Hospital 6 West**
J. Walker

**Hospital 6 East**
B. McDermott

**Library**
D. Noble

**Medical Illustration**
S. Robertson

**Mould Room**
R. Allen

**Nutrition**
N. Pellicer

**Plant Operations**
S. Young

**Prosthetics**
H. Drake

**Purchasing**
J. Easton

**Radiotherapy**
G. Sherstan

*Victoria Cancer Clinic*

**Clinical Trials**
M. Gaunt

**Health Records**
N. Besta

**Medical Oncology**
Dr. K.S. Wilson

**Nursing**
M. Sauder

**Nutrition**
T. Mushins

**Pharmacy**
J. Barnett

**Physics**
Dr. D. Linekin

**Radiation Oncology**
Dr. S. Alexander

**Radiotherapy Planning**
L. Blenkinsop

**Radiotherapy Treatment**
M. Stuart

**Social Work**
S. Rodning

# CCABC Professional Staff



*Medical, Dental and Scientific Staff*

**Director, D.J. Klaassen, BA, MD, FRCPC, FACP**, Clinical Professor (Medicine)

*Clinical Hematology*

**A.C. Eaves, BSc, MSc, MD, PhD, FRCPC, FACP**, Head, Professor (Medicine and Pathology)

**M. Barnett, MD, MRCP**, Clinical Assistant Professor (Medicine)

**D.E. Hogge, MD, PhD, FRCPC**, Assistant Professor (Medicine)

**R.K. Humphries, BSc, MSc, MD, PhD**, Assistant Professor (Medicine)

**H. Klingemann, MD**, Clinical Associate Professor (Medicine)

**P.M. Lansdorp, MD, PhD**, Clinical Assistant Professor (Medicine)

**G.L. Phillips, MD, ABIM**, Associate Professor (Medicine)

**D. Reece, MD, FRCPC**, Clinical Assistant Professor (Medicine)

**A. Grigg, MD**, BMT Fellow

**P. Galbraith, MD**, Clinical Associate

**N. Graham, MD**, Clinical Associate

**M. Jancewicz, MD**, Clinical Associate

*Terry Fox Laboratory*

**A.C. Eaves***, Head

**C.J. Eaves, BA, MSc, PhD**, Professor (Medical Genetics)

**D.E. Hogge***

**R.K. Humphries***

**D.K. Kalousek, MD, FRCPC, FCCMG**, Associate Professor (Pathology)

**G. Krystal, BSc, MSc, PhD**, Associate Professor (Pathology)

**P.M. Lansdorp***

**D.L. Mager, BSc, MSc, PhD**, Associate Professor (Medical Genetics)

**F. Takei, BSc, PhD**, Associate Professor (Pathology)

*Clinical Pathology*

**A.J. Worth, MD, FRCPC**, Head, Clinical Professor (Pathology)

**R.W. Coupland, MD, FRCPC**, Clinical Instructor (Pathology)

**R.D. Gascoyne, MD, FRCPC**, Clinical Instructor (Pathology)

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**K.G. Lerner, MD, FACP**, Clinical Assistant Professor (Pathology)

**A. Milliner, MD, FRCPC**, Clinical Assistant Professor (Pathology)

**F.J. Roberts, MD, FRCPC**, Clinical Professor (Pathology)

*Cytology Pathology*

**G.H. Anderson, MB, BS, FRCPC**, Head, Clinical Professor (Pathology)

**J.C. LeRiche, MB, ChB, FRCPC**, Clinical Associate Professor (Pathology)

**J.P. Matisic, MD, FRCPC**, Clinical Instructor (Pathology)

**K.C. Suen, MD, FRCPC**, Clinical Professor (Pathology)

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**D.I. McLean, BSc, MD, FRCPC**, Head, Associate Professor (Medicine)

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**L.M. Warshawski, MD, FRCPC**, Clinical Instructor (Medicine)

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**H.A. Mueller, BA, MD, DABR, FACR**, Head, Clinical Professor (Diag Rad)

**S.M. Bhimji, MD, ChB, FRCPC**, Clinical Assistant Professor (Diag Rad)

**D. Harrison, BSc, MD,FRCPC**, Clinical Assistant Professor (Diag Rad)

**J. Morgan-Parkes, MD, FRCPC**, Clinical Associate Professor (Diag Rad)

**P. Hassell, BSc, MDCM, FRCPC**

*Epidemiology, Biometry and Occupational Oncology*

**P.R. Band, BA, MD, FRCPC**, Head, Honorary Professor (Medicine), Clinical Professor (Health Care & Epi)

**A.J. Coldman, BSc, MA, Diploma in Epidemiology, PhD**, Adjunct Professor (Statistics)

**R.P. Gallagher, BSc, MA**, Clinical Assistant Professor (Health Care & Epi), Associate Member (Ophthalmology)

**T.G.Hislop, BSc, MSc, MD, CM**, Clinical Assistant Professor (Health Care & Epi)

**M.L. McBride, BA, MSc**, Honorary Lecturer (Health Care & Epi)

**J.J. Spinelli, BSc, MSc**, Honorary Lecturer (Health Care & Epi)

**W.J. Threlfall, BSc, MSc**

**V.T.Y. Ng, MMath**

*Gynecologic Oncology*

**J.L. Benedet, MD, FRCSC**, Head, Professor (Obs & Gyne)

**B.D. Acker***

**P.J. Hoskins***

**M.F. Manji***

**E.J. McMurtrie, MD, FRCSC**, Clinical Instructor (Obs & Gyne)

**E. Martin, MD**, Clinical Associate

**J. Pike, MD**, Clinical Associate

**K.D. Swenerton***

**M. Turko, MD, FRCSC**, Associate Professor (Obs & Gyne)

**D. Matthews, MD** (Resident)

**S. Thomson, MD** (Resident)

**S. Hudson, MD** (Resident)

**D. Vine, MD** (Resident)

**J. Al-Sanyour, MD** (Resident)

*Medical Oncology*

**J.H. Goldie, MD, FRCPC**, Head, Clinical Professor (Medicine)

**P.R. Band***

**N. Bruchovsky***

**K. Cadenhead, MD**, Clinical Associate

**J.M. Connors, MD, ABIM, FRCPC**, Clinical Associate Professor (Medicine)

**C.M.L. Coppin, BA, MA, BM, BCh, DPhil, MRCP(UK), FRCPC**, Clinical Associate Professor (Medicine)

**G.W.K. Donaldson, BSc, MB, ChB, MRCP (Edin & London), FRCPC** (Interior Clinic)

**P.J. Hoskins, BA, MB, MRCP(UK), FRCPC**, Clinical Assistant Professor (Medicine)

**S. Howdle, BSc, MD, CM, CCFP**, Clinical Associate

**H. Karsi, MD**, Clinical Associate

**D.J. Klaassen***

**R. Klasa, MD, FRCPC**, Clinical Assistant Professor (Medicine)

**P. Klimo, MD, ABIM, ABIMO, FRCPC**, Clinical Assistant Professor (Medicine)

**M.A. Knowling, MD, FRCPC**, Clinical Assistant Professor (Medicine)

**M. Lymburner, MD, PhD**, Clinical Associate

**W.C. MacDonald, MD, FRCPC**, Associate Professor (Medicine)

**O. Marcos, BA, MD**, Clinical Associate

**K. Murphy, BSc, MD, CM, FRCPC**, Clinical Assistant Professor (Medicine)

**R.N. Murray, MD, FRCPC**, Clinical Associate Professor (Medicine)

**S. O'Reilly, BSc, BC, MB, ChB, BAO, MRCP(I), FRCPC**, Clinical Assistant Professor (Medicine)

**D. Osoba, BSc, MD, FRCPC**, Clinical Professor (Medicine)

**I.H. Plenderleith, BSc, MD, FRCPC**, Clinical Professor (Medicine)

**J. Ragaz, MD, LRCP, MRCS, FRCPC**, Clinical Associate Professor (Medicine)

**D. Ripley, MD**, Clinical Associate (Victoria)

**L. Saretsky, MD**

**A.M. Shah, BSc, MD, CM, FRCPC**, Clinical Assistant Professor (Medicine)

**T. Shenkier, MD**

**H.K.B. Silver***

**D.S.Stuart, MD, FRCPC**, Clinical Instructor (Medicine)

**K.D. Swenerton, MD, FRCPC**, Clinical Associate Professor (Medicine)

**K.S. Wilson, MB, FRCP(Edin), FRCPC, FACP (Victoria)**, Clinical Assistant Professor (Medicine)

**A. Lohri, MD**, (Fellow)

**C. Bryce, MD**, (Resident)

**D. Holland, MD**, (Resident)

**M. McLaughlin, MD, FRCP, ABIM**, (Resident)

**B. Samson, MD**, (Resident)

**B. Yeung, MD**, (Resident)

*Section of Advanced Therapeutics*

**H.K.B. Silver, BSc, MD, PhD, FRCPC, FACP**, Head, Clinical Professor (Medicine)

**J.H. Goldie***

**F.A. Salinas, BSc, DVM**, Clinical Professor (Pathology)

**S.R. Dedhar, BSc, MSc, PhD**, Assistant Professor (Pathology)

*Section of Cancer Endocrinology*

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**C.T. Beer, FRIC, DPhil(Oxford)**, Professor Emeritus (Biochemistry), Honorary Member, CCABC Professional Staff

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**P.W. Gout, PhD**, Honorary Associate Professor (Surgery)

**E.C. Jones, MD, FRCPC**

**R.L. Noble, MD, PhD, DSc(London), FRSC**, Professor Emeritus (Physiology), Honorary Member, CCABC Professional Staff

**P.S. Rennie, PhD**, Honorary Professor (Surgery)

*Pediatric Oncology*

**C.J.H.Fryer, LRCP, MRCS, DMRT, FRCPC**, Head, Clinical Associate Professor (Ped)

**K.W. Chan, MB, FRCPC**, Assistant Professor (P.T.)(Ped)

**S.L. Pritchard, BM, BS, FRCPC**, Clinical Instructor (Ped)

**P. Rogers, MB, MRCP(UK), FRCPC**, Associate Professor (Ped)

**J.M. Teasdale, MB, ChB, FRCPC**, Associate Professor (Ped)

*Radiation Oncology*

**S.M. Jackson, MB, ChB, MD (Manchester), DMRT, FRCR, FRCPC**, Head, Clinical Professor (Surgery)

**B.D. Acker, BSc(Hon), MD, DABR, FRCPC**, Clinical Assistant Professor (Surgery)

**S. Alexander, MB, BS, LRCP, MRCS, DMRT, DABR(T), FRCR, FRCPC** (Victoria)

**V.E. Basco, MB, ChB, DMRT, FRCR, FRCPC**, Clinical Professor (Surgery)

**E. Cairns, MD**, Clinical Associate

**M. Chu, MD, CCFP**, Clinical Associate

**P. Coy, MB, ChB, DMRT, FRCPC (Victoria)**, Clinical Assistant Professor (Surgery)

**G. Duncan, MB, ChB, BSc, MRCP(UK), FRCPC**, Clinical Instructor

**R.N. Fairey, BSc(Hon. Zoology), MD, FRCPC**, Clinical Associate Professor (Surgery)

**J.C.M. Fetterly, MD, DMRT, FRCPC** (Victoria)

**A.D. Flores, BSc, MD, FRCPC**, Clinical Associate Professor (Surgery)

**C.J.H. Fryer***

**G.B. Goodman***

**C. Grafton, MB, BS, MRCS, MRCP, FRCR, FRCPC, PhD**, Clinical Assistant Professor (Surgery)

**J.H. Hay, MB, BChir, DCH, MRCP(UK), DMRT, FRCR, FRCPC**, Clinical Assistant Professor

**E.C. Kostashuk, MD, CCFP, FRCPC**, Clinical Assistant Professor (Surgery)

**W.Y.V. Leung Lam, MD**, Clinical Associate

**E. Laukkanen, BSc, (Hon. Physics & Applied Math), MSc, MD, FRCPC** (Victoria)

**C.M. Ludgate, MB, ChB, MD, FRCSE, DMRT, FRCPC** (Victoria), Clinical Associate Professor (Surgery)

**J.L. Matheson, MD**, Clinical Associate

**M.F. Manji, MB, ChB, DMRT, MD, DABR, FRCPC**, Clinical Assistant Professor (Surgery)

**I.A. Olivotto, MD, FRCPC**, Clinical Instructor (Surgery)

**C. Parsons, MD, CCFP**

**D.E. Rheaume, BSc, MSc, MD, FRCPC**, Clinical Instructor (Surgery)

**N.J.S. Voss, LRCP, MRCS, DMRT, FRCR, FRCPC**, Clinical Assistant Professor (Surgery)

**F.L-W. Wong, BSc(Hon. Biochem), MD, FRCPC**, Clinical Assistant Professor

**C. Kim-Sing, MB, ChB, MD**, (Resident)

**E.N. Loewen, BSc, MEd, MD**, (Resident)

**M. Mildenberger, BSc, MD**, (Resident)

**M.M. McKenzie, BSc, MD**, (Resident)

**W.J. Morris, BSc, MSc, MD**, (Resident)

**P. Selke, MD, FRCSC (Obs/Gyn)**, (Resident)

**B. Tsang, MB, BCh**, (Resident)

*Section of Developmental Radiotherapy*

**G.B. Goodman, FRCPC, FRCP (Edin), FRCR, FACR**, Head, Clinical Professor (Surgery)

**J.L. Bowen, MD, FRCPC**, Clinical Fellow - TRIUMF

**Y. Ogawa, MD**, Clinical Fellow - TRIUMF

*Radiation Physics*

**R.O. Kornelsen, BSc, MSc, PhD, FCCPM**, Head, Honorary Lecturer

**R.W. Harrison, BSc, MSc**

**S.G. Hussein, BSC, MSc, PhD, FCCPM**

**G.M. Kennelly, BSc, FCCPM**

**W.S.Y. Kwa, BSC, MSc, MCCPM**

**G.K.Y. Lam, BSc, PhD**, Honorary Assistant Professor

**D.M. Linekin, BSc, MSc, PhD** (Victoria)

**B. McParland, BSc, MSc, PhD, FCCPM** (Victoria)

**L.J. Watts, BSc, MSc**

**K.F.K. Yuen, BSc, MSc, PhD**

*Surgical Oncology*

**R.E. Robins, MD, FRCSC, Head**, Clinical Professor (Surgery)

*Senior Allied Professional Staff*

**L. Chow, BSc (Pharm)**

**R. Doll, MSW, MSC**, Field Instructor (Social Work)

**Rev. C. Johnstone, BA, BD, ThM**, Adjunct Faculty (Vancouver School of Theology)

**D. Noble, BSc, BLS**

**D.C. Richardson, B.Comm., CHE**

**L.B. Jamieson, RN, BScN, MBA**

**B.T. Schmidt, OD, MSc, CHE**

*Academic credentials and clinical appointments noted elsewhere.

# Financial Statements

## Five-Year Financial Highlights

| | 1988/89 $ 000 | 1987/88 $ 000 | 1986/87 $ 000 | 1985/86 $ 000 | 1984/85 $ 000 |
|---|---|---|---|---|---|
| **Expenditures** | | | | | |
| The increase in total expenditures over the past five years shows the growing role of the Agency in assuming financial responsibility for cancer care in the province. | | | | | |
| Operating Fund | **$59,578** | $55,240 | $50,303 | $45,156 | $37,921 |
| Screening Mammography Program * | **371** | — | — | — | — |
| Investigative Grants Fund | **3,082** | 3,134 | 2,914 | 2,206 | 2,222 |
| Plant Fund | **1,588** | 1,345 | 6,508 | 2,705 | 7,913 |
| Total Expenditures | **$64,619** | $59,719 | $59,725 | $50,067 | $48,056 |
| **Net Operating Results** | | | | | |
| The deficits for the current and immediately preceding years were incurred as planned to utilize the accumulated surplus from previous years. | | | | | |
| Excess (Deficiency) of Operating Fund revenue over expenditure for the year | **$ (87)** | $(380) | $(1,180) | $(1,274) | $ 1,357 |
| % of Operating Fund expenditure | **(0.1%)** | (0.7%) | (2.3%) | (2.8%) | 3.6% |

** Screening Mammography Program*

The Screening Mammography Program of B.C. commenced in July 1988 with a stand-alone clinic operated by the Agency as a pilot site, with the expectation of an eventual province-wide network of clinics to be operated by an independent society.

## Financial Statements

# Condensed Statements of Revenue, Expenditure and Surplus

For the year ended March 31, 1989
with comparative figures for the
year ended March 31, 1988

| | | 1989 $000 | 1988 $000 |
|---|---|---|---|
| **Operating Fund** | | | |
| Revenue | Government grants | **$55,997** | $51,958 |
| | Recoveries for services | **2,588** | 1,923 |
| | Investment and other income | **906** | 978 |
| | | **59,491** | 54,859 |
| Expenditure | Salaries, wages and benefits | **40,523** | 37,541 |
| | Patient care | **13,136** | 11,776 |
| | Plant and support services | **5,919** | 5,922 |
| | | **59,578** | 55,239 |
| Current year's excess (deficiency) of revenue over expenditure | | **(87)** | (380) |
| Surplus, beginning of year | | **631** | 1,011 |
| Surplus, end of year | | **$544** | $631 |
| **Plant Fund** | | | |
| Surplus, beginning of year | | **$43,286** | $45,099 |
| Add: Capital grants received | | **1,565** | 1,273 |
| | | **44,851** | 46,372 |
| Deduct: Depreciation | | **(2,905)** | (3,086) |
| Surplus, end of year | | **$41,946** | $43,286 |

The information shown in the condensed financial statements is extracted from the Agency's full financial statements for the year ended March 31, 1989 on which the Agency's auditors, Clarkson Gordon, have reported. Copies of their report and of the full financial statements are available on request.

# Financial Statements

## Condensed Balance Sheets

as at March 31, 1989
with comparative figures as at
March 31, 1988

| | | 1989 $000 | 1988 $000 |
|---|---|---|---|
| Assets | Cash | $ 2,900 | $ 3,128 |
| | Amounts receivable | 1,684 | 2,157 |
| | Inventory of supplies & prepaid expenses | 1,238 | 988 |
| | | 5,822 | 6,273 |
| | Buildings and equipment | 41,946 | 43,286 |
| | | $ 47,768 | $ 49,559 |
| Liabilities | Accounts payable and accruals | $ 5,278 | $ 3,883 |
| | Deferred income | — | 1,759 |
| | | 5,278 | 5,642 |
| Surplus | Operating fund | 544 | 631 |
| | Plant fund | 41,946 | 43,286 |
| | | $ 47,768 | $ 49,559 |

The information shown in the condensed financial statements is extracted from the Agency's full financial statements for the year ended March 31, 1989 on which the Agency's auditors, Clarkson Gordon, have reported. Copies of their report and of the full financial statements are available on request.

# CCABC Patient Statistics

| | April 88 - March 89 | | | April 87 - March 88 | | |
|---|---|---|---|---|---|---|
| | Vancouver Clinic | Victoria Clinic | Outreach Clinics | Vancouver Clinic | Victoria Clinic | Outreach Clinics |
| **New Patient Examinations** (including second sites) | 6,215 | 1,412 | 815 | 5,892 | 1,319 | 782 |
| **Treatments: Radiation** | | | | | | |
| Patients completed - All modalities | 5,239 | 1,343 | — | 5,323 | 1,257 | — |
| Fields treated | | | | | | |
| X-rays and cobalt | 132,450 | 34,820 | — | 130,113 | 33,413 | — |
| Radium and caesium | 471 | 54 | — | 548 | 76 | — |
| Other | — | — | — | — | — | — |
| Total | 132,921 | 34,874 | — | 130,661 | 33,489 | — |
| Patient visits | 59,770 | 16,115 | — | 60,496 | 14,879 | — |
| **Treatments: Chemotherapy** | | | | | | |
| Patients started | 6,308 | N/A | — | 6,060 | N/A | — |
| Patient visits | 9,972 | 2,199 | — | 10,113 | 1,328 | — |
| **Other Ambulatory Care Visits** | 36,378 | 7,922 | 5,516 | 34,112 | 8,791 | 5,641 |

*N/A Not Available*

## Number of Referred Cases To The Vancouver and Victoria Cancer Clinics

JANUARY 1, 1988-DECEMBER 31, 1988

| Site/Histology | Vancouver | Victoria |
|---|---|---|
| BREAST | 1,230 | 338 |
| ENDOCRINE GLANDS | | |
| Thyroid Gland | 38 | 11 |
| Other Endocrine Glands | 7 | 3 |
| GASTROINTESTINAL | | |
| Colon | 193 | 55 |
| Esophagus | 91 | 15 |
| Gallbladder & Biliary Tract | 29 | 3 |
| Liver | 19 | 4 |
| Pancreas | 77 | 19 |
| Rectum, Rectosigmoid & Anus | 258 | 58 |
| Small Intestine | 7 | 3 |
| Stomach | 85 | 20 |
| GENITOURINARY | | |
| Kidney, Ureter, Urethra | 109 | 24 |
| Penis & Other Male Genital Organs | 10 | 3 |
| Prostate | 705 | 161 |
| Testicle | 66 | 14 |
| Urinary Bladder | 161 | 22 |
| GYNECOLOGY | | |
| Cervix Uteri | 104 | 17 |
| Corpus Uteri (Endometrium, Myometrium) | 278 | 44 |
| Ovary, Fallopian Tube & Broad Ligament | 161 | 53 |
| Placenta (Hydatidiform Mole) | 3 | 0 |
| Other & Unspecified Female Genital Organs | 29 | 4 |
| HEAD & NECK | | |
| Eye & Lacrimal Gland | 4 | 0 |
| Larynx | 98 | 21 |
| Lip | 29 | 3 |
| Mouth | 100 | 22 |
| Nasal Cavities | 16 | 4 |
| Pharynx | 118 | 17 |
| Salivary Glands | 23 | 2 |

| Site/Histology | Vancouver | Victoria |
|---|---|---|
| LUNG, THYMUS, HEART & MEDIASTINUM | | |
| Trachea, Bronchus & Lung | 933 | 248 |
| Thymus, Heart & Mediastinum | 9 | 1 |
| PRIMARY UNKNOWN | 121 | 33 |
| RETROPERITONEUM | 6 | 0 |
| SKIN | 363 | 90 |
| CENTRAL NERVOUS SYSTEM | | |
| Brain | 146 | 26 |
| Other & Unspecified Parts of the Nervous System | 23 | 1 |
| MALIGNANT MELANOMA | 295 | 60 |
| MESOTHELIOMAS | 12 | 5 |
| RETICULOENDOTHELIAL & HEMATOPOIETIC SYSTEMS | | |
| Hodgkin's Disease | 75 | 7 |
| Leukemia | 104 | 16 |
| Multiple Myeloma | 77 | 19 |
| Non-Hodgkin's Disease | 284 | 55 |
| Other Malignant & Borderline Diseases of the Reticuloendothelial & Hematopoietic Systems | 23 | 7 |
| SARCOMA | | |
| Bones, Joints, Articular Cartilage, Connective, Subcutaneous & Soft Tissue | 103 | 16 |
| Kaposi's Sarcoma | 17 | 1 |
| NON-CANCER | 175 | 17 |
| MISCELLANEOUS | 1 | 0 |
| **TOTALS** | **6,815** | **1,542** |
| YOUTH CANCERS(included in above breakdown) | 126 | 5 |

# Ten Most Frequent Types of Cancer
(BY SEX AND AGE GROUP)

## REFERRED TO THE VANCOUVER CANCER CLINIC IN 1988

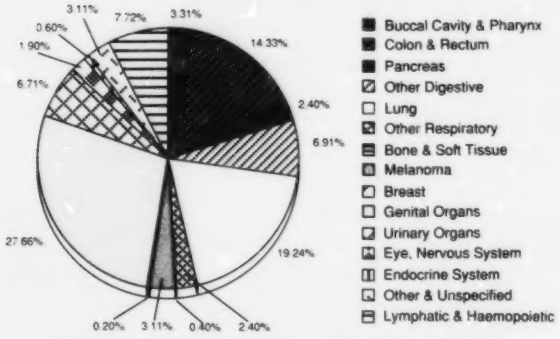
| | 0-16 | | 17-24 | | 25-34 | | 35-44 | | 45-54 | | 55-64 | | 65-74 | | 75-84 | | 85+ | | TOTAL | | GRAND TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | |
| Breast | 0 | 0 | 0 | 1 | 49 | 0 | 179 | 2 | 268 | 2 | 268 | 2 | 297 | 1 | 134 | 2 | 25 | 0 | 1220 | 10 | 1230 |
| Trachea, Bronchus, Lung | 0 | 0 | 1 | 0 | 2 | 0 | 9 | 11 | 40 | 63 | 94 | 190 | 113 | 223 | 57 | 108 | 7 | 15 | 323 | 610 | 933 |
| Prostate | — | 0 | — | 0 | — | 0 | — | 1 | — | 8 | — | 140 | — | 365 | — | 179 | — | 12 | — | 705 | 705 |
| Skin | 0 | 1 | 0 | 1 | 2 | 3 | 7 | 11 | 22 | 19 | 31 | 44 | 41 | 52 | 39 | 46 | 26 | 18 | 168 | 195 | 363 |
| Malignant Melanoma | 1 | 0 | 4 | 2 | 27 | 19 | 31 | 24 | 35 | 14 | 19 | 36 | 14 | 34 | 14 | 11 | 6 | 4 | 151 | 144 | 295 |
| Non-Hodgkin's Lymphoma | 1 | 4 | 6 | 4 | 7 | 10 | 12 | 23 | 19 | 27 | 19 | 29 | 31 | 45 | 17 | 27 | 1 | 2 | 113 | 171 | 284 |
| Corpus Uteri | 0 | — | 1 | — | 1 | — | 13 | — | 29 | — | 72 | — | 120 | — | 35 | — | 7 | — | 278 | — | 278 |
| Rectum, Rectosigmoid, & Anus | 0 | 0 | 0 | 0 | 3 | 2 | 8 | 5 | 19 | 23 | 32 | 34 | 39 | 49 | 21 | 17 | 5 | 1 | 127 | 131 | 258 |
| Colon | 0 | 0 | 1 | 0 | 1 | 0 | 4 | 5 | 15 | 15 | 32 | 21 | 26 | 45 | 14 | 12 | 2 | 0 | 95 | 98 | 193 |
| Urinary Bladder | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 3 | 1 | 13 | 3 | 29 | 16 | 45 | 8 | 31 | 3 | 6 | 33 | 128 | 161 |
| Ovary, Fallopian Tube, Broad Ligament | 1 | — | 3 | — | 9 | — | 24 | — | 28 | — | 30 | — | 47 | — | 16 | — | 3 | — | 161 | — | 161 |

## REFERRED TO THE VICTORIA CANCER CLINIC IN 1988

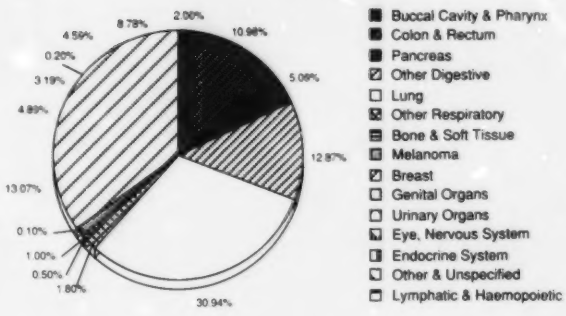
| | 0-16 | | 17-24 | | 25-34 | | 35-44 | | 45-54 | | 55-64 | | 65-74 | | 75-84 | | 85+ | | TOTAL | | GRAND TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | |
| Breast | 0 | 0 | 1 | 0 | 6 | 0 | 31 | 0 | 46 | 0 | 107 | 0 | 99 | 1 | 42 | 0 | 5 | 0 | 337 | 1 | 338 |
| Trachea, Bronchus, Lung | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 11 | 20 | 21 | 40 | 37 | 60 | 18 | 34 | 2 | 3 | 91 | 157 | 248 |
| Prostate | — | 0 | — | 0 | — | 0 | — | 0 | — | 5 | — | 31 | — | 97 | — | 25 | — | 3 | — | 161 | 161 |
| Skin | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 4 | 11 | 9 | 16 | 18 | 12 | 8 | 3 | 7 | 44 | 46 | 90 |
| Malignant Melanoma | 0 | 0 | 2 | 1 | 5 | 5 | 5 | 6 | 5 | 6 | 5 | 3 | 3 | 6 | 3 | 4 | 0 | 1 | 28 | 32 | 60 |
| Rectum, Rectosigmoid & Anus | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 3 | 1 | 10 | 10 | 5 | 14 | 5 | 5 | 0 | 1 | 25 | 33 | 58 |
| Colon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 6 | 10 | 10 | 9 | 10 | 2 | 1 | 1 | 0 | 26 | 29 | 55 |
| Non-Hodgkin's Lymphoma | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 4 | 1 | 1 | 10 | 2 | 6 | 8 | 5 | 6 | 4 | 2 | 29 | 26 | 55 |
| Ovary, Fallopian Tube, Broad Ligament | 0 | — | 0 | — | 3 | — | 3 | — | 11 | — | 16 | — | 15 | — | 5 | — | 0 | — | 53 | — | 53 |
| Corpus Uteri | 0 | — | 0 | — | 0 | — | 2 | — | 3 | — | 11 | — | 19 | — | 8 | — | 1 | — | 44 | — | 44 |

# B.C. Cancer Statistics 1987

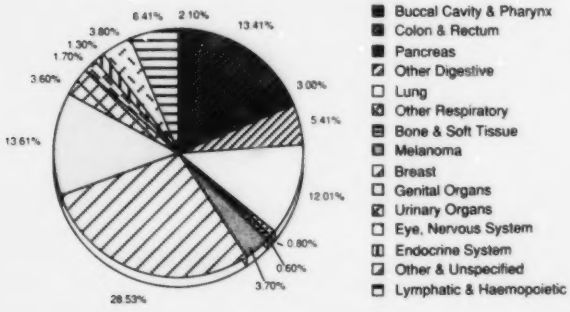
## Relative Frequency of New Cases of Cancer Diagnosed in 1987 Males 15 and Over



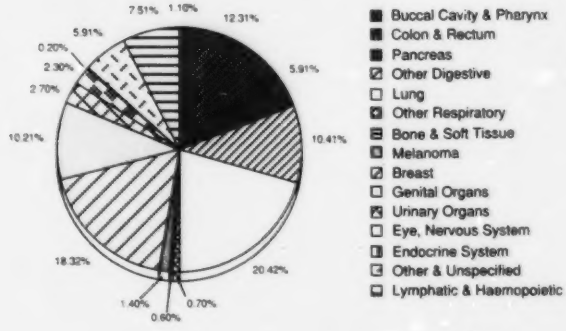

## Relative Frequency of Cancer Deaths in 1987 Males 15 and Over



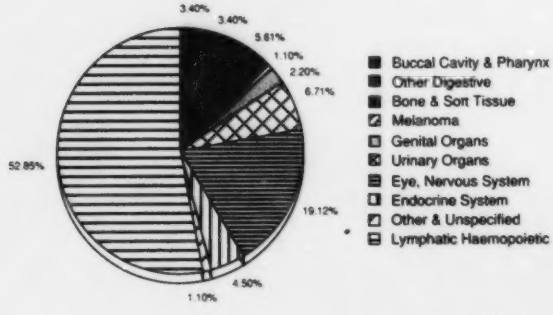

## Relative Frequency of New Cases of Cancer Diagnosed in 1987 Females 15 and Over



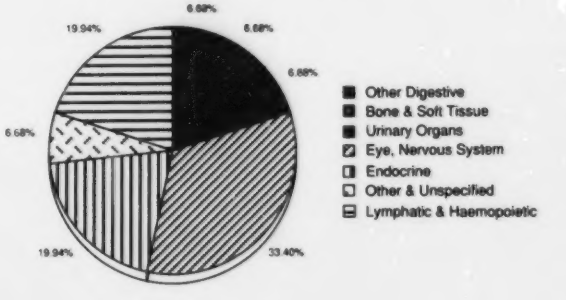

## Relative Frequency of Cancer Deaths in 1987 Females 15 and Over




## Relative Frequency of New Cases of Cancer Diagnosed in 1987 Children under 15



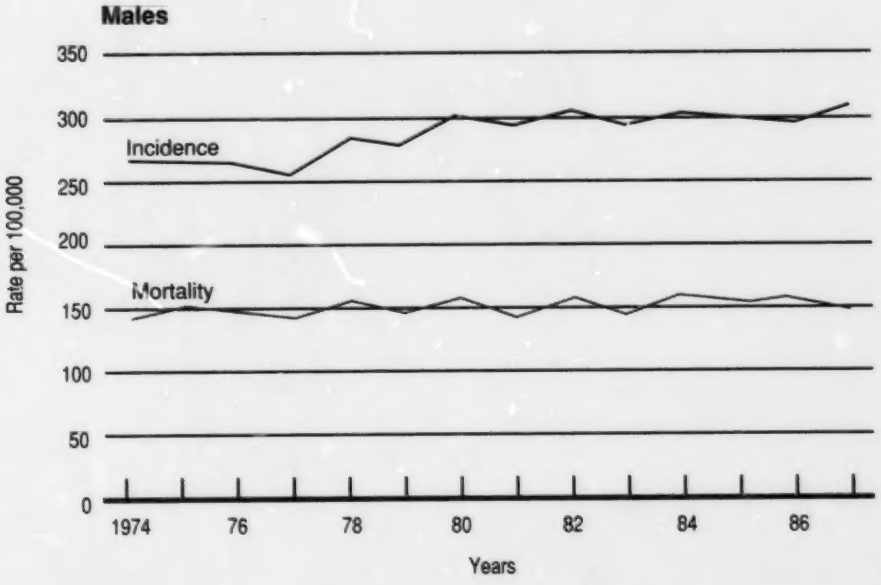

## Relative Frequency of Cancer Deaths in 1987 Children under 15

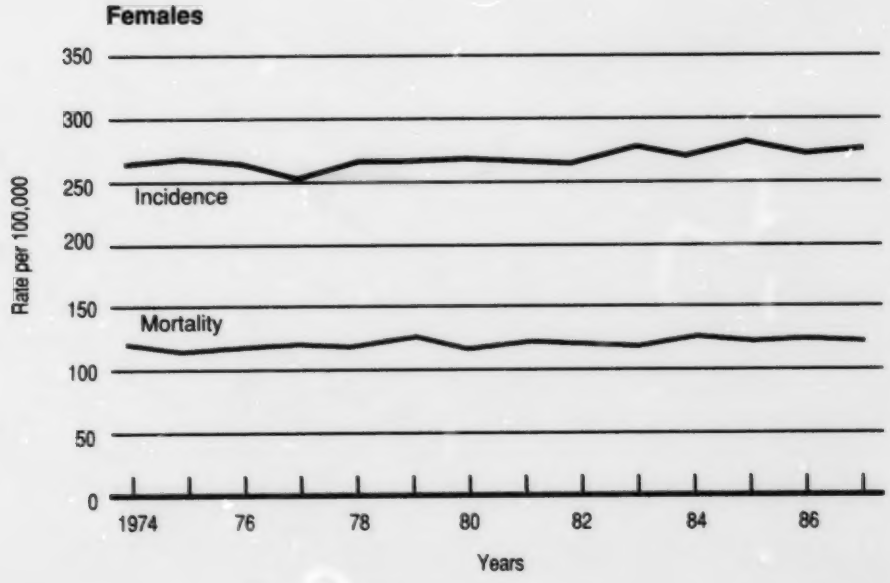


**B.C. Cancer Statistics 1987**

## Age Standardized Incidence and Mortality Rates

For All Cancers Diagnosed in B.C., 1974-87
(invasive cases only; excludes basal and squamous cell cancers of skin)



# B.C. Cancer Statistics 1987

## New Cancer Primaries
By Sex and Age Group

| | 0-34 | | 35-44 | | 45-54 | | 55-64 | | 65-74 | | 75-84 | | 85-UP | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Lip | 0 | 0 | 1 | 2 | 5 | 1 | 5 | 0 | 12 | 4 | 8 | 2 | 4 | 1 | 35 | 10 |
| Tongue | 0 | 2 | 3 | 1 | 8 | 1 | 10 | 6 | 8 | 7 | 1 | 2 | 1 | 0 | 31 | 19 |
| Mouth | 2 | 2 | 3 | 1 | 6 | 3 | 19 | 11 | 19 | 18 | 7 | 11 | 5 | 4 | 61 | 50 |
| Pharynx | 1 | 2 | 7 | 5 | 12 | 8 | 21 | 8 | 26 | 8 | 8 | 3 | 1 | 0 | 76 | 34 |
| Esophagus | 0 | 0 | 1 | 0 | 9 | 3 | 26 | 6 | 26 | 9 | 16 | 14 | 6 | 5 | 84 | 37 |
| Stomach | 3 | 0 | 5 | 2 | 21 | 6 | 51 | 27 | 65 | 28 | 51 | 36 | 5 | 21 | 201 | 120 |
| Small Intestine | 1 | 0 | 2 | 0 | 2 | 1 | 2 | 1 | 3 | 3 | 5 | 3 | 1 | 3 | 16 | 11 |
| Colon | 1 | 1 | 11 | 9 | 38 | 28 | 108 | 82 | 190 | 150 | 127 | 135 | 36 | 61 | 511 | 466 |
| Rectum | 1 | 3 | 8 | 5 | 34 | 20 | 93 | 63 | 119 | 72 | 82 | 81 | 20 | 21 | 357 | 265 |
| Liver | 5 | 0 | 2 | 1 | 5 | 3 | 13 | 5 | 15 | 11 | 19 | 10 | 5 | 2 | 64 | 32 |
| Gallbladder | 1 | 1 | 1 | 2 | 1 | 3 | 4 | 16 | 8 | 18 | 11 | 16 | 5 | 10 | 31 | 66 |
| Pancreas | 0 | 0 | 4 | 2 | 12 | 10 | 26 | 27 | 56 | 50 | 44 | 44 | 6 | 31 | 148 | 164 |
| Larynx | 0 | 0 | 6 | 0 | 9 | 2 | 34 | 5 | 35 | 9 | 14 | 1 | 3 | 1 | 101 | 18 |
| Trachea, Bronchus, Lung | 4 | 4 | 22 | 15 | 91 | 71 | 307 | 153 | 436 | 260 | 259 | 121 | 51 | 32 | 1170 | 656 |
| Bone, Connective Tissue | 9 | 9 | 3 | 2 | 2 | 2 | 2 | 9 | 6 | 11 | 1 | 3 | 4 | 3 | 27 | 39 |
| Melanoma-Skin | 16 | 36 | 38 | 43 | 37 | 34 | 36 | 36 | 39 | 35 | 22 | 14 | 2 | 1 | 190 | 199 |
| Other Skin | 63 | 72 | 200 | 172 | 319 | 240 | 642 | 443 | 898 | 649 | 638 | 467 | 163 | 206 | 2923 | 2249 |
| Breast | 0 | 39 | 0 | 169 | 2 | 228 | 6 | 377 | 4 | 438 | 3 | 217 | 0 | 86 | 15 | 1554 |
| Cervix | — | 29 | — | 34 | — | 18 | — | 14 | — | 19 | — | 13 | — | 2 | — | 129 |
| Uterus | — | 2 | — | 6 | — | 45 | — | 75 | — | 131 | — | 58 | — | 10 | — | 327 |
| Ovary | — | 11 | — | 23 | — | 41 | — | 53 | — | 61 | — | 38 | — | 15 | — | 242 |
| Other Female Genital Organs | — | 0 | — | 3 | — | 3 | — | 6 | — | 9 | — | 10 | — | 9 | — | 40 |
| Prostate | 1 | — | 4 | — | 25 | — | 263 | — | 682 | — | 484 | — | 134 | — | 1593 | — |
| Testis | 41 | — | 21 | — | 1 | — | 2 | — | 2 | — | 2 | — | 0 | — | 69 | — |
| Bladder | 4 | 0 | 6 | 2 | 9 | 5 | 42 | 17 | 101 | 24 | 72 | 31 | 22 | 16 | 256 | 95 |
| Kidney | 4 | 5 | 7 | 13 | 18 | 10 | 39 | 25 | 49 | 29 | 30 | 16 | 6 | 6 | 153 | 104 |
| Brain | 23 | 12 | 9 | 7 | 16 | 9 | 25 | 17 | 20 | 23 | 16 | 13 | 0 | 2 | 109 | 83 |
| Thyroid | 5 | 24 | 9 | 12 | 5 | 10 | 3 | 10 | 6 | 11 | 5 | 5 | 1 | 1 | 34 | 73 |
| Non-Hodgkin's Lymphoma | 24 | 10 | 15 | 9 | 22 | 21 | 48 | 28 | 56 | 48 | 41 | 45 | 10 | 15 | 216 | 176 |
| Hodgkin's Disease | 18 | 19 | 5 | 2 | 5 | 1 | 3 | 1 | 2 | 5 | 1 | 1 | 1 | 1 | 35 | 30 |
| Multiple Myeloma | 0 | 0 | 2 | 0 | 4 | 5 | 13 | 6 | 24 | 17 | 17 | 10 | 5 | 4 | 65 | 42 |
| Leukemia: Acute Lymphatic | 22 | 9 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 1 | 27 | 11 |
| Chronic Lymphatic | 1 | 0 | 1 | 1 | 6 | 3 | 12 | 6 | 23 | 7 | 17 | 13 | 10 | 7 | 70 | 37 |
| Acute Granulocytic | 4 | 5 | 1 | 3 | 2 | 1 | 4 | 0 | 6 | 4 | 8 | 5 | 3 | 2 | 28 | 20 |
| Chronic Granulocytic | 5 | 2 | 5 | 0 | 3 | 3 | 2 | 0 | 6 | 3 | 1 | 3 | 2 | 1 | 24 | 12 |
| Other & Unspecified | 3 | 1 | 0 | 0 | 3 | 1 | 10 | 1 | 10 | 10 | 9 | 10 | 4 | 7 | 39 | 30 |
| Other Primary Sites | 13 | 11 | 8 | 6 | 8 | 5 | 27 | 20 | 26 | 15 | 19 | 12 | 10 | 9 | 111 | 78 |
| Unknown & Ill-Defined Sites | 3 | 3 | 5 | 9 | 12 | 16 | 47 | 39 | 59 | 57 | 53 | 58 | 11 | 28 | 190 | 210 |
| TOTAL | 278 | 314 | 415 | 561 | 753 | 861 | 1945 | 1593 | 3037 | 2253 | 2094 | 1522 | 538 | 624 | 9060 | 7728 |

## B.C. Cancer Statistics 1987

## Incidence Rates (per 100,000)
By Sex and Age Group

| | 0-34 | | 35-44 | | 45-54 | | 55-64 | | 65-74 | | 75-84 | | 85-UP | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Lip | 0.0 | 0.0 | 0.4 | 0.9 | 3.3 | 0.7 | 3.7 | 0.0 | 11.8 | 3.2 | 17.3 | 3.1 | 40.0 | 4.8 | 2.4 | 0.7 |
| Tongue | 0.0 | 0.3 | 1.3 | 0.5 | 5.2 | 0.7 | 7.3 | 4.3 | 7.9 | 5.7 | 2.2 | 3.1 | 10.0 | 0.0 | 2.1 | 1.3 |
| Mouth | 0.3 | 0.3 | 1.3 | 0.5 | 3.9 | 2.0 | 13.9 | 7.8 | 18.7 | 14.6 | 15.1 | 17.3 | 50.0 | 19.0 | 4.2 | 3.4 |
| Pharynx | 0.1 | 0.3 | 3.1 | 2.3 | 7.8 | 5.4 | 15.4 | 5.7 | 25.6 | 6.5 | 17.3 | 4.7 | 10.0 | 0.0 | 5.2 | 2.3 |
| Esophagus | 0.0 | 0.0 | 0.4 | 0.0 | 5.9 | 2.0 | 19.0 | 4.3 | 25.6 | 7.3 | 34.6 | 22.0 | 60.0 | 23.8 | 5.8 | 2.5 |
| Stomach | 0.4 | 0.0 | 2.2 | 0.9 | 13.7 | 4.1 | 37.3 | 19.2 | 64.0 | 22.7 | 110.2 | 56.5 | 50.0 | 100.0 | 13.9 | 8.1 |
| Small Intestine | 0.1 | 0.0 | 0.9 | 0.0 | 1.3 | 0.7 | 1.5 | 0.7 | 3.0 | 2.4 | 10.8 | 4.7 | 10.0 | 14.3 | 1.1 | 0.7 |
| Colon | 0.1 | 0.1 | 4.9 | 4.1 | 24.8 | 19.0 | 78.9 | 58.2 | 187.0 | 121.9 | 274.3 | 211.9 | 360.0 | 290.5 | 35.3 | 31.5 |
| Rectum | 0.1 | 0.4 | 3.6 | 2.3 | 22.2 | 13.5 | 68.0 | 44.7 | 117.1 | 58.5 | 177.1 | 127.2 | 200.0 | 100.0 | 24.7 | 17.9 |
| Liver | 0.6 | 0.0 | 0.9 | 0.5 | 3.3 | 2.0 | 9.5 | 3.6 | 14.8 | 8.9 | 41.0 | 15.7 | 50.0 | 9.5 | 4.4 | 2.2 |
| Gallbladder | 0.1 | 0.1 | 0.4 | 0.9 | 0.7 | 2.0 | 2.9 | 11.4 | 7.9 | 14.6 | 23.8 | 25.1 | 50.0 | 47.6 | 2.1 | 4.5 |
| Pancreas | 0.0 | 0.0 | 1.8 | 0.9 | 7.8 | 6.8 | 19.0 | 19.2 | 55.1 | 40.6 | 95.0 | 69.1 | 60.0 | 147.6 | 10.2 | 11.1 |
| Larynx | 0.0 | 0.0 | 2.7 | 0.0 | 5.9 | 1.4 | 24.9 | 3.6 | 34.4 | 7.3 | 30.2 | 1.6 | 30.0 | 4.8 | 7.0 | 1.2 |
| Trachea. Bronchus. Lung | 0.5 | 0.5 | 9.8 | 6.8 | 59.4 | 48.1 | 224.4 | 108.7 | 429.1 | 211.2 | 559.4 | 190.0 | 510.0 | 152.4 | 80.8 | 44.4 |
| Bone, Connective Tissue | 1.2 | 1.2 | 1.3 | 0.9 | 1.3 | 1.4 | 1.5 | 6.4 | 5.9 | 8.9 | 2.2 | 4.7 | 40.0 | 14.3 | 1.9 | 2.6 |
| Melanoma-Skin | 2.1 | 4.7 | 17.0 | 19.5 | 24.1 | 23.0 | 26.3 | 25.6 | 38.4 | 28.4 | 47.5 | 22.0 | 20.0 | 4.8 | 13.1 | 13.5 |
| Other Skin | 8.1 | 9.5 | 89.3 | 78.0 | 208.1 | 162.5 | 469.3 | 314.6 | 883.9 | 527.2 | 1378.0 | 733.1 | 1630.0 | 981.0 | 201.9 | 152.2 |
| Breast | 0.0 | 5.1 | 0.0 | 76.6 | 1.3 | 154.4 | 4.4 | 267.8 | 3.9 | 355.8 | 6.5 | 340.7 | 0.0 | 409.5 | 1.0 | 105.2 |
| Cervix | — | 3.8 | — | 15.4 | — | 12.2 | — | 9.9 | — | 15.4 | — | 20.4 | — | 9.5 | — | 8.7 |
| Uterus | — | 0.3 | — | 2.7 | — | 30.5 | — | 53.3 | — | 106.4 | — | 91.1 | — | 47.6 | — | 22.1 |
| Ovary | — | 1.4 | — | 10.4 | — | 27.8 | — | 37.6 | — | 49.6 | — | 59.7 | — | 71.4 | — | 16.4 |
| Other Female Genital Organs | — | 0.0 | — | 1.4 | — | 2.0 | — | 4.3 | — | 7.3 | — | 15.7 | — | 42.9 | — | 2.7 |
| Prostate | 0.1 | — | 1.8 | — | 16.3 | — | 192.3 | — | 671.3 | — | 1045.4 | — | 1340.0 | — | 110.0 | — |
| Testis | 5.3 | — | 9.4 | — | 0.7 | — | 1.5 | — | 2.0 | — | 4.3 | — | 0.0 | — | 4.8 | — |
| Bladder | 0.5 | 0.0 | 2.7 | 0.9 | 5.9 | 3.4 | 30.7 | 12.1 | 99.4 | 19.5 | 155.5 | 48.7 | 220.0 | 76.2 | 17.7 | 6.4 |
| Kidney | 0.5 | 0.7 | 3.1 | 5.9 | 11.7 | 6.8 | 28.5 | 17.8 | 48.2 | 23.6 | 64.8 | 25.1 | 60.0 | 8.6 | 10.6 | 7.0 |
| Brain | 3.0 | 1.6 | 4.0 | 3.2 | 10.4 | 6.1 | 18.3 | 12.1 | 19.7 | 18.7 | 34.6 | 20.4 | 0.0 | 9.5 | 7.5 | 5.6 |
| Thyroid | 0.6 | 3.2 | 4.0 | 5.4 | 3.3 | 6.8 | 2.2 | 7.1 | 5.9 | 8.9 | 10.8 | 7.8 | 10.0 | 4.8 | 2.3 | 4.9 |
| Non-Hodgkin's Lymphoma | 3.1 | 1.3 | 6.7 | 4.1 | 14.4 | 14.2 | 35.1 | 19.9 | 55.1 | 39.0 | 88.6 | 70.6 | 100.0 | 71.4 | 14.9 | 11.9 |
| Hodgkin's Disease | 2.3 | 2.5 | 2.2 | 0.9 | 3.3 | 0.7 | 2.2 | 0.7 | 2.0 | 4.1 | 2.2 | 1.6 | 10.0 | 4.8 | 2.4 | 2.0 |
| Multiple Myeloma | 0.0 | 0.0 | 0.9 | 0.0 | 2.6 | 3.4 | 9.5 | 4.3 | 23.6 | 13.8 | 36.7 | 15.7 | 50.0 | 19.0 | 4.5 | 2.8 |
| Leukemia: Acute Lymphatic | 2.8 | 1.2 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.5 | 1.6 | 10.0 | 4.8 | 1.9 | 0.7 |
| Chronic Lymphatic | 0.1 | 0.0 | 0.4 | 0.5 | 3.9 | 2.0 | 8.8 | 4.3 | 22.6 | 5.7 | 36.7 | 20.4 | 100.0 | 33.3 | 4.8 | 2.5 |
| Acute Granulocytic | 0.5 | 0.7 | 0.4 | 1.4 | 1.3 | 0.7 | 2.9 | 0.0 | 5.9 | 3.2 | 17.3 | 7.8 | 30.0 | 9.5 | 1.9 | 1.4 |
| Chronic Granulocytic | 0.6 | 0.3 | 2.2 | 0.0 | 2.0 | 2.0 | 1.5 | 0.0 | 5.9 | 2.4 | 2.2 | 4.7 | 20.0 | 4.8 | 1.7 | 0.8 |
| Other & Unspecified | 0.4 | 0.1 | 0.0 | 0.0 | 2.0 | 0.7 | 7.3 | 0.7 | 9.8 | 8.1 | 19.4 | 15.7 | 40.0 | 33.3 | 2.7 | 2.0 |
| Other Primary Sites | 1.7 | 1.4 | 3.6 | 2.7 | 5.2 | 3.4 | 19.7 | 14.2 | 25.6 | 12.2 | 41.0 | 18.8 | 100.0 | 42.9 | 7.7 | 5.3 |
| Unknown & Ill-Defined Sites | 0.4 | 0.4 | 2.2 | 4.1 | 7.8 | 10.8 | 34.4 | 27.7 | 58.1 | 46.3 | 114.5 | 91.1 | 110.0 | 133.3 | 13.1 | 14.2 |
| TOTAL | 35.8 | 41.3 | 185.4 | 254.3 | 491.2 | 582.9 | 1421.8 | 1131.4 | 2989.2 | 1830.2 | 4522.7 | 2389.3 | 5380.0 | 2971.4 | 625.8 | 522.9 |

## B.C. Cancer Statistics 1987

## Age Standardized Incidence (per 100,000) by Sex

| | Male | | | | | Female | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1983 | 1984 | 1985 | 1986 | 1987 | 1983 | 1984 | 1985 | 1986 | 1987 |
| Lip | 2.9 | 3.0 | 2.8 | 2.5 | 1.8 | 0.6 | 0.4 | 0.7 | 0.4 | 0.5 |
| Tongue | 2.0 | 2.3 | 1.7 | 1.8 | 1.7 | 1.3 | 1.4 | 1.3 | 1.0 | 1.0 |
| Mouth | 3.2 | 3.7 | 3.5 | 2.9 | 3.3 | 2.1 | 2.0 | 2.7 | 1.5 | 2.5 |
| Pharynx | 4.1 | 4.1 | 4.3 | 4.2 | 4.0 | 1.3 | 1.7 | 1.7 | 1.5 | 1.9 |
| Esophagus | 4.3 | 4.2 | 4.5 | 4.6 | 4.4 | 1.8 | 1.7 | 2.1 | 1.5 | 1.7 |
| Stomach | 11.9 | 10.7 | 11.7 | 10.5 | 10.3 | 5.7 | 5.0 | 6.5 | 5.7 | 5.7 |
| Small Intestine | 0.6 | 1.1 | 0.8 | 1.1 | 0.8 | 0.5 | 0.6 | 0.8 | 0.6 | 0.5 |
| Colon | 24.0 | 23.9 | 25.6 | 24.3 | 25.4 | 23.9 | 25.8 | 25.2 | 24.2 | 21.8 |
| Rectum | 14.6 | 17.3 | 17.7 | 17.8 | 18.2 | 12.7 | 13.1 | 14.8 | 13.0 | 12.9 |
| Liver | 3.0 | 2.6 | 2.9 | 4.1 | 3.3 | 1.6 | 1.5 | 1.6 | 1.8 | 1.5 |
| Gallbladder | 1.9 | 1.6 | 1.3 | 1.9 | 1.5 | 2.8 | 2.2 | 2.0 | 2.6 | 3.2 |
| Pancreas | 9.4 | 7.8 | 8.3 | 8.3 | 7.4 | 7.6 | 5.9 | 6.1 | 6.0 | 7.6 |
| Larynx | 5.9 | 5.1 | 4.3 | 5.0 | 5.3 | 1.1 | 1.2 | 0.5 | 0.4 | 0.9 |
| Trachea, Bronchus, Lung | 59.5 | 60.1 | 60.5 | 58.7 | 59.1 | 28.6 | 30.1 | 27.8 | 30.9 | 32.5 |
| Bone, Connective Tissue | 2.9 | 2.5 | 3.5 | 3.0 | 1.6 | 2.0 | 2.5 | 1.3 | 2.4 | 2.2 |
| Melanoma-Skin | 9.3 | 8.1 | 10.6 | 9.4 | 10.4 | 10.5 | 9.4 | 12.8 | 10.3 | 11.1 |
| Other Skin | 118.8 | 126.3 | 138.5 | 139.4 | 150.5 | 98.8 | 95.2 | 103.7 | 104.8 | 112.1 |
| Breast | 0.5 | 0.5 | 0.5 | 0.3 | 0.8 | 81.2 | 76.3 | 84.6 | 82.4 | 80.7 |
| Cervix | — | — | — | — | — | 9.0 | 6.6 | 8.2 | 7.1 | 7.0 |
| Uterus | — | — | — | — | — | 16.1 | 17.3 | 17.3 | 16.1 | 16.5 |
| Ovary | — | — | — | — | — | 12.7 | 16.6 | 12.9 | 12.0 | 12.8 |
| Other Female Genital Organs | — | — | — | — | — | 1.8 | 2.0 | 1.8 | 2.2 | 1.9 |
| Prostate | 56.2 | 57.5 | 63.7 | 65.7 | 76.2 | — | — | — | — | — |
| Testis | 4.2 | 4.3 | 3.9 | 4.3 | 4.0 | — | — | — | — | — |
| Bladder | 16.1 | 14.6 | 13.2 | 13.3 | 12.5 | 5.5 | 4.9 | 4.5 | 4.4 | 4.4 |
| Kidney | 8.0 | 9.5 | 7.8 | 7.8 | 8.0 | 4.0 | 4.0 | 5.1 | 5.0 | 5.5 |
| Brain | 6.2 | 8.9 | 6.1 | 5.6 | 6.3 | 3.9 | 4.0 | 4.9 | 4.0 | 4.6 |
| Thyroid | 1.8 | 1.6 | 1.1 | 1.7 | 1.9 | 3.5 | 3.6 | 3.5 | 4.2 | 4.2 |
| Non-Hodgkin's Lymphoma | 11.0 | 11.7 | 11.8 | 12.6 | 11.7 | 10.0 | 7.6 | 8.5 | 8.1 | 8.8 |
| Hodgkin's Disease | 2.6 | 3.2 | 3.4 | 2.3 | 2.4 | 2.0 | 2.9 | 1.5 | 2.3 | 1.9 |
| Multiple Myeloma | 3.4 | 4.0 | 3.3 | 3.5 | 3.2 | 3.2 | 3.1 | 2.8 | 2.4 | 2.0 |
| Leukemia: Acute Lymphatic | 2.0 | 1.8 | 2.3 | 1.9 | 2.2 | 1.4 | 1.3 | 1.0 | 1.2 | 0.9 |
| Chronic Lymphatic | 2.9 | 3.2 | 2.9 | 3.7 | 3.5 | 1.4 | 2.4 | 0.9 | 2.2 | 1.8 |
| Acute Granulocytic | 1.1 | 2.2 | 1.1 | 1.2 | 1.6 | 1.3 | 1.6 | 1.3 | 0.9 | 1.1 |
| Chronic Granulocytic | 0.9 | 1.5 | 0.8 | 1.5 | 1.3 | 1.2 | 0.8 | 0.9 | 0.8 | 0.7 |
| Other & Unspecified | 2.3 | 2.4 | 1.7 | 1.9 | 2.0 | 1.5 | 1.4 | 1.2 | 1.8 | 1.3 |
| Other Primary Sites | 4.8 | 4.6 | 4.6 | 3.9 | 4.4 | 3.7 | 3.2 | 2.5 | 3.7 | 3.3 |
| Unknown & Ill-Defined Sites | 11.6 | 10.8 | 8.7 | 9.4 | 9.6 | 10.0 | 9.9 | 9.3 | 8.8 | 10.1 |
| TOTAL | 413.9 | 426.6 | 439.2 | 440.0 | 460.9 | 376.2 | 369.4 | 384.3 | 378.2 | 389.0 |

# B.C. Cancer Statistics 1987

## Cancer Deaths by Sex and Age Group

| | 0-34 | | 35-44 | | 45-54 | | 55-64 | | 65-74 | | 75-84 | | 85-UP | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Lip | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 |
| Tongue | 0 | 0 | 0 | 0 | 1 | 0 | 5 | 4 | 6 | 2 | 1 | 3 | 1 | 0 | 14 | 9 |
| Mouth | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 3 | 6 | 2 | 0 | 1 | 0 | 1 | 10 | 8 |
| Pharynx | 2 | 0 | 2 | 0 | 1 | 1 | 9 | 3 | 10 | 4 | 8 | 2 | 2 | 1 | 34 | 11 |
| Esophagus | 0 | 0 | 2 | 0 | 9 | 1 | 24 | 3 | 30 | 8 | 24 | 6 | 5 | 4 | 94 | 22 |
| Stomach | 2 | 0 | 2 | 0 | 13 | 5 | 26 | 17 | 46 | 24 | 42 | 26 | 6 | 23 | 137 | 95 |
| Small Intestine | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 4 | 0 | 0 | 2 | 0 | 2 | 7 | 5 |
| Colon | 1 | 2 | 6 | 2 | 16 | 15 | 45 | 28 | 88 | 69 | 68 | 80 | 27 | 43 | 251 | 239 |
| Rectum | 1 | 1 | 2 | 0 | 5 | 3 | 13 | 12 | 21 | 21 | 25 | 26 | 8 | 12 | 75 | 75 |
| Liver | 4 | 0 | 3 | 1 | 4 | 2 | 13 | 6 | 19 | 8 | 17 | 12 | 3 | 4 | 63 | 33 |
| Gallbladder | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 10 | 4 | 11 | 5 | 14 | 3 | 11 | 14 | 49 |
| Pancreas | 1 | 0 | 4 | 2 | 13 | 13 | 25 | 25 | 54 | 47 | 45 | 40 | 8 | 25 | 150 | 152 |
| Larynx | 0 | 0 | 0 | 0 | 1 | 0 | 10 | 4 | 15 | 4 | 4 | 2 | 3 | 0 | 33 | 10 |
| Trachea, Bronchus, Lung | 4 | 1 | 16 | 10 | 61 | 51 | 214 | 123 | 341 | 197 | 238 | 103 | 47 | 36 | 921 | 521 |
| Bone, Connective Tissue | 1 | 3 | 3 | 0 | 2 | 1 | 3 | 3 | 2 | 5 | 2 | 2 | 1 | 3 | 14 | 17 |
| Melanoma-Skin | 2 | 2 | 6 | 9 | 2 | 5 | 7 | 6 | 10 | 5 | 2 | 6 | 0 | 3 | 29 | 36 |
| Other Skin | — | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 6 | 1 | 3 | 2 | 3 | 1 | 14 | 7 |
| Breast | — | 7 | 1 | 37 | 0 | 47 | 1 | 116 | 1 | 136 | 0 | 80 | 1 | 45 | 4 | 468 |
| Cervix | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 | — | 0 |
| Uterus | — | 1 | — | 4 | — | 13 | — | 16 | — | 34 | — | 20 | — | 9 | — | 97 |
| Ovary | — | 1 | — | 7 | — | 17 | — | 37 | — | 57 | — | 24 | — | 13 | — | 156 |
| Other Female Genital Organs | — | 0 | — | 0 | — | 1 | — | 0 | — | 1 | — | 3 | — | 4 | — | 9 |
| Prostate | 0 | — | 0 | — | 6 | — | 31 | — | 117 | — | 150 | — | 78 | — | 382 | — |
| Testis | 3 | — | 0 | — | 1 | — | 0 | — | 0 | — | 0 | — | 0 | — | 4 | — |
| Bladder | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 2 | 31 | 8 | 27 | 9 | 11 | 10 | 77 | 30 |
| Kidney | 0 | 2 | 1 | 1 | 4 | 2 | 20 | 8 | 24 | 12 | 11 | 11 | 7 | 3 | 67 | 39 |
| Brain | 12 | 4 | 7 | 5 | 14 | 7 | 26 | 16 | 23 | 17 | 12 | 8 | 0 | 0 | 94 | 57 |
| Thyroid | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 1 | 2 | 4 | 3 |
| Non-Hodgkin's Lymphoma | 5 | 2 | 4 | 0 | 8 | 3 | 18 | 13 | 35 | 20 | 22 | 28 | 5 | 11 | 97 | 77 |
| Hodgkin's Disease | 5 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 8 | 4 |
| Multiple Myeloma | 0 | 0 | 1 | 0 | 1 | 0 | 11 | 6 | 19 | 14 | 18 | 12 | 4 | 3 | 54 | 35 |
| Leukemia: Acute Lymphatic | 5 | 3 | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 1 | 2 | 2 | 1 | 1 | 12 | 8 |
| Chronic Lymphatic | 0 | 0 | 1 | 0 | 2 | 1 | 4 | 1 | 11 | 3 | 8 | 6 | 5 | 3 | 31 | 14 |
| Acute Granulocytic | 0 | 2 | 2 | 0 | 1 | 1 | 3 | 0 | 6 | 2 | 8 | 3 | 2 | 2 | 22 | 10 |
| Chronic Granulocytic | 0 | 0 | 6 | 1 | 0 | 1 | 0 | 2 | 1 | 3 | 4 | 1 | 0 | 0 | 11 | 8 |
| Other & Unspecified | 3 | 0 | 1 | 1 | 5 | 2 | 3 | 3 | 8 | 9 | 4 | 12 | 4 | 9 | 28 | 36 |
| Other Primary Sites | 8 | 1 | 3 | 5 | 7 | 5 | 21 | 9 | 25 | 20 | 27 | 23 | 8 | 15 | 99 | 78 |
| Unknown & Ill-Defined Sites | 1 | 0 | 4 | 3 | 13 | 13 | 31 | 15 | 35 | 42 | 45 | 54 | 10 | 23 | 139 | 150 |
| TOTAL | 60 | 33 | 78 | 91 | 194 | 215 | 579 | 494 | 1002 | 788 | 827 | 624 | 255 | 323 | 2995 | 2568 |

# B.C. Cancer Statistics 1987

## Mortality Rates (per 100,000) by Sex and Age Group

| | 0-34 | | 35-44 | | 45-54 | | 55-64 | | 65-74 | | 75-84 | | 85-UP | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Lip | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.2 | 0.0 | 10.0 | 0.0 | 0.1 | 0.0 |
| Tongue | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 3.7 | 2.9 | 5.9 | 1.6 | 2.2 | 4.8 | 10.0 | 0.0 | 1.0 | 0.6 |
| Mouth | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 2.2 | 2.1 | 5.9 | 1.6 | 0.0 | 1.6 | 0.0 | 4.8 | 0.7 | 0.5 |
| Pharynx | 0.3 | 0.0 | 0.9 | 0.0 | 0.7 | 0.7 | 6.6 | 2.1 | 9.9 | 3.3 | 17.8 | 3.2 | 20.0 | 4.8 | 2.4 | 0.7 |
| Esophagus | 0.0 | 0.0 | 0.9 | 0.0 | 5.9 | 0.7 | 17.6 | 2.1 | 29.7 | 6.6 | 53.3 | 9.5 | 50.0 | 19.0 | 6.5 | 1.5 |
| Stomach | 0.3 | 0.0 | 0.9 | 0.0 | 8.6 | 3.4 | 19.1 | 12.1 | 45.5 | 19.7 | 93.3 | 41.3 | 60.0 | 109.5 | 9.5 | 6.5 |
| Small Intestine | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.7 | 1.5 | 0.0 | 4.0 | 0.0 | 0.0 | 3.2 | 0.0 | 9.5 | 0.5 | 0.3 |
| Colon | 0.1 | 0.3 | 2.7 | 0.9 | 10.5 | 10.2 | 33.1 | 20.0 | 87.1 | 56.6 | 151.1 | 127.0 | 270.0 | 204.8 | 17.4 | 16.2 |
| Rectum | 0.1 | 0.1 | 0.9 | 0.0 | 3.3 | 2.0 | 9.6 | 8.6 | 20.8 | 17.2 | 55.6 | 41.3 | 80.0 | 57.1 | 5.2 | 5.1 |
| Liver | 0.5 | 0.0 | 1.3 | 0.5 | 2.6 | 1.4 | 9.6 | 4.3 | 18.8 | 6.6 | 37.8 | 19.0 | 30.0 | 19.0 | 4.4 | 2.2 |
| Gallbladder | 0.0 | 0.0 | 0.0 | 0.9 | 0.7 | 0.7 | 0.7 | 7.1 | 4.0 | 9.0 | 11.1 | 22.2 | 30.0 | 52.4 | 1.0 | 3.3 |
| Pancreas | 0.1 | 0.0 | 1.8 | 0.9 | 8.6 | 8.8 | 18.4 | 17.9 | 53.5 | 38.5 | 100.0 | 63.5 | 80.0 | 119.0 | 10.4 | 10.3 |
| Larynx | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 7.4 | 2.9 | 14.9 | 3.3 | 8.9 | 3.2 | 30.0 | 0.0 | 2.3 | 0.7 |
| Trachea, Bronchus, Lung | 0.5 | 0.1 | 7.2 | 4.5 | 40.1 | 34.7 | 157.4 | 87.9 | 337.6 | 161.5 | 528.9 | 163.5 | 470.0 | 171.4 | 63.9 | 35.4 |
| Bone, Connective Tissue | 0.1 | 0.4 | 1.3 | 0.0 | 1.3 | 0.7 | 2.2 | 2.1 | 2.0 | 4.1 | 4.4 | 3.2 | 10.0 | 14.3 | 1.0 | 1.2 |
| Melanoma-Skin | 0.3 | 0.3 | 2.7 | 4.1 | 1.3 | 3.4 | 5.1 | 4.3 | 9.9 | 4.1 | 4.4 | 9.5 | 0.0 | 14.3 | 2.0 | 2.4 |
| Other Skin | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.7 | 1.5 | 0.7 | 5.9 | 0.8 | 6.7 | 3.2 | 30.0 | 4.8 | 1.0 | 0.5 |
| Breast | 0.0 | 0.9 | 0.4 | 16.8 | 0.0 | 32.0 | 0.7 | 82.9 | 1.0 | 111.5 | 0.0 | 127.0 | 10.0 | 214.3 | 0.3 | 31.8 |
| Cervix | — | 0.0 | — | 0.0 | — | 0.0 | — | 0.0 | — | 0.0 | — | 0.0 | — | 0.0 | — | 0.0 |
| Uterus | — | 0.1 | — | 1.8 | — | 8.8 | — | 11.4 | — | 27.9 | — | 31.7 | — | 42.9 | — | 6.6 |
| Ovary | — | 0.1 | — | 3.2 | — | 11.6 | — | 26.4 | — | 46.7 | — | 38.1 | — | 61.9 | — | 10.6 |
| Other Female Genital Organs | — | 0.0 | — | 0.0 | — | 0.7 | — | 0.0 | — | 0.8 | — | 4.8 | — | 19.0 | — | 0.6 |
| Prostate | 0.0 | — | 0.0 | — | 3.9 | — | 22.8 | — | 115.8 | — | 333.3 | — | 780.0 | — | 26.5 | — |
| Testis | 0.4 | — | 0.0 | — | 0.7 | — | 0.0 | — | 0.0 | — | 0.0 | — | 0.0 | — | 0.3 | — |
| Bladder | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 5.9 | 1.4 | 30.7 | 6.6 | 60.0 | 14.3 | 110.0 | 47.6 | 5.3 | 2.0 |
| Kidney | 0.0 | 0.3 | 0.4 | 0.5 | 2.6 | 1.4 | 14.7 | 5.7 | 23.8 | 9.8 | 24.4 | 17.5 | 70.0 | 14.3 | 4.6 | 2.7 |
| Brain | 1.6 | 0.5 | 3.1 | 2.3 | 9.2 | 4.8 | 19.1 | 11.4 | 22.8 | 13.9 | 26.7 | 12.7 | 0.0 | 0.0 | 6.5 | 3.9 |
| Thyroid | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 6.7 | 0.0 | 10.0 | 9.5 | 0.3 | 0.2 |
| Non-Hodgkin's Lymphoma | 0.6 | 0.3 | 1.8 | 0.0 | 5.3 | 2.0 | 13.2 | 9.3 | 34.7 | 16.4 | 48-9 | 44.4 | 50.0 | 52.4 | 6.7 | 5.2 |
| Hodgkin's Disease | 0.6 | 0.0 | 0.4 | 0.5 | 0.0 | 0.0 | 0.0 | 0.7 | 1.0 | 0.0 | 2.2 | 1.6 | 0.0 | 4.8 | 0.6 | 0.3 |
| Multiple Myeloma | 0.0 | 0.0 | 0.4 | 0.0 | 0.7 | 0.0 | 8.1 | 4.3 | 18.8 | 11.5 | 40.0 | 19.0 | 40.0 | 14.3 | 3.7 | 2.4 |
| Leukemia: Acute Lymphatic | 0.6 | 0.4 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.7 | 3.0 | 0.8 | 4.4 | 3.2 | 10.0 | 4.8 | 0.8 | 0.5 |
| Chronic Lymphatic | 0.0 | 0.0 | 0.4 | 0.0 | 1.3 | 0.7 | 2.9 | 0.7 | 10.9 | 2.5 | 17.8 | 9.5 | 50.0 | 14.3 | 2.2 | 1.0 |
| Acute Granulocytic | 0.0 | 0.3 | 0.9 | 0.0 | 0.7 | 0.7 | 2.2 | 0.0 | 5.9 | 1.6 | 17.8 | 4.8 | 20.0 | 9.5 | 1.5 | 0.7 |
| Chronic Granulocytic | 0.0 | 0.0 | 2.7 | 0.5 | 0.0 | 0.7 | 0.0 | 1.4 | 1.0 | 2.5 | 8.9 | 1.6 | 0.0 | 0.0 | 0.8 | 0.5 |
| Other & Unspecified | 0.4 | 0.0 | 0.4 | 0.5 | 3.3 | 1.4 | 2.2 | 2.1 | 7.9 | 7.4 | 8.9 | 19.0 | 40.0 | 42.9 | 1.9 | 2.4 |
| Other Primary Sites | 1.0 | 0.1 | 1.3 | 2.3 | 4.6 | 3.4 | 15.4 | 6.4 | 24.8 | 16.4 | 60.0 | 36.5 | 80.0 | 71.4 | 6.9 | 5.3 |
| Unknown & Ill-Defined Sites | 0.1 | 0.0 | 1.8 | 1.4 | 8.6 | 8.8 | 22.8 | 10.7 | 34.7 | 34.4 | 100.0 | 85.7 | 100.0 | 109.5 | 9.6 | 10.2 |
| TOTAL | 7.8 | 4.4 | 35.0 | 41.4 | 127.6 | 146.3 | 425.7 | 352.9 | 992.1 | 645.9 | 1837.8 | 990.5 | 2550.0 | 1538.1 | 207.8 | 174.6 |

# B.C. Cancer Statistics 1987

## Age Standardized Mortality (per 100,000) by Sex and Age Group

| | Male | | | | | Female | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1983 | 1984 | 1985 | 1986 | 1987 | 1983 | 1984 | 1985 | 1986 | 1987 |
| Lip | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tongue | 1.0 | 1.2 | 0.6 | 1.4 | 0.7 | 0.4 | 0.5 | 0.4 | 0.5 | 0.5 |
| Mouth | 1.3 | 0.8 | 0.9 | 0.8 | 0.5 | 0.6 | 0.4 | 0.3 | 0.7 | 0.4 |
| Pharynx | 1.8 | 2.1 | 1.8 | 1.4 | 1.7 | 0.5 | 0.7 | 0.4 | 0.8 | 0.6 |
| Esophagus | 4.2 | 4.7 | 4.6 | 4.1 | 4.9 | 2.0 | 2.0 | 1.4 | 1.9 | 1.0 |
| Stomach | 8.6 | 7.7 | 7.1 | 8.3 | 7.0 | 4.5 | 3.7 | 4.8 | 4.0 | 4.4 |
| Small Intestine | 0.1 | 0.4 | 0.2 | 0.2 | 0.4 | 0.4 | 0.2 | 0.4 | 0.3 | 0.2 |
| Colon | 11.4 | 13.6 | 11.2 | 11.2 | 12.6 | 11.4 | 11.2 | 11.2 | 10.8 | 11.0 |
| Rectum | 5.7 | 4.3 | 4.3 | 4.1 | 3.8 | 2.9 | 3.5 | 2.9 | 2.6 | 3.5 |
| Liver | 2.8 | 2.5 | 3.1 | 3.2 | 3.3 | 1.7 | 1.1 | 1.2 | 2.2 | 1.6 |
| Gallbladder | 1.2 | 1.4 | 1.3 | 1.5 | 0.7 | 1.5 | 2.2 | 2.0 | 1.6 | 2.3 |
| Pancreas | 9.2 | 7.7 | 8.2 | 9.0 | 7.6 | 6.9 | 7.6 | 6.1 | 6.4 | 7.2 |
| Larynx | 1.8 | 1.9 | 1.5 | 2.0 | 1.7 | 0.5 | 0.1 | 0.3 | 0.3 | 0.5 |
| Trachea, Bronchus, Lung | 45.7 | 51.6 | 48.6 | 47.1 | 46.7 | 21.2 | 20.6 | 21.9 | 25.0 | 25.8 |
| Bone, Connective Tissue | 1.2 | 1.5 | 1.3 | 1.3 | 0.8 | 0.9 | 1.2 | 1.0 | 1.1 | 0.9 |
| Melanoma-Skin | 1.8 | 1.5 | 2.2 | 2.0 | 1.5 | 1.3 | 1.9 | 1.3 | 1.1 | 1.9 |
| Other Skin | 0.7 | 0.8 | 0.2 | 0.3 | 0.7 | 0.5 | 0.2 | 0.3 | 0.0 | 0.4 |
| Breast | 0.0 | 0.1 | 0.2 | 0.1 | 0.2 | 24.2 | 23.4 | 24.8 | 25.4 | 23.5 |
| Cervix | — | — | — | — | — | 2.2 | 2.2 | 2.5 | 2.0 | 0.0 |
| Uterus | — | — | — | — | — | 2.8 | 2.9 | 2.2 | 2.6 | 4.8 |
| Ovary | — | — | — | — | — | 7.2 | 8.7 | 7.3 | 7.9 | 7.8 |
| Other Female Genital Organs | — | — | — | — | — | 0.2 | 0.6 | 0.4 | 0.6 | 0.4 |
| Prostate | 14.9 | 16.7 | 16.3 | 19.0 | 18.4 | — | — | — | — | — |
| Testis | 0.2 | 0.3 | 0.4 | 0.1 | 0.3 | — | — | — | — | — |
| Bladder | 4.7 | 4.3 | 5.0 | 4.3 | 3.7 | 0.9 | 1.6 | 1.7 | 1.5 | 1.3 |
| Kidney | 3.5 | 4.3 | 3.8 | 3.7 | 3.5 | 1.8 | 2.1 | 1.6 | 2.0 | 2.0 |
| Brain | 4.1 | 5.6 | 5.7 | 4.6 | 5.4 | 3.1 | 2.9 | 3.5 | 2.6 | 3.1 |
| Thyroid | 0.3 | 0.5 | 0.1 | 0.2 | 0.2 | 0.8 | 0.6 | 0.4 | 0.1 | 0.1 |
| Non-Hodgkin's Lymphoma | 5.7 | 4.7 | 5.9 | 4.7 | 5.1 | 4.6 | 4.0 | 4.4 | 3.7 | 3.6 |
| Hodgkin's Disease | 0.4 | 0.4 | 0.2 | 0.7 | 0.5 | 0.3 | 0.2 | 0.6 | 0.4 | 0.2 |
| Multiple Myeloma | 1.9 | 2.4 | 2.5 | 2.6 | 2.6 | 2.1 | 2.4 | 2.3 | 2.1 | 1.6 |
| Leukemia: Acute Lymphatic | 0.7 | 0.7 | 0.5 | 0.6 | 0.7 | 0.1 | 0.8 | 0.7 | 0.3 | 0.5 |
| Chronic Lymphatic | 1.3 | 1.5 | 1.3 | 1.1 | 1.6 | 0.8 | 0.9 | 0.9 | 0.5 | 0.6 |
| Acute Granulocytic | 0.9 | 1.3 | 1.3 | 0.8 | 1.1 | 1.0 | 1.5 | 0.9 | 1.1 | 0.5 |
| Chronic Granulocytic | 0.5 | 1.1 | 0.8 | 0.6 | 0.5 | 1.0 | 0.7 | 0.5 | 0.6 | 0.4 |
| Other & Unspecified | 2.7 | 3.3 | 2.1 | 1.7 | 1.5 | 1.2 | 1.6 | 1.6 | 1.5 | 1.6 |
| Other Primary Sites | 3.9 | 4.1 | 4.4 | 4.0 | 4.3 | 3.3 | 5.0 | 5.0 | 4.6 | 3.3 |
| Unknown & Ill-Defined Sites | 5.0 | 5.9 | 5.9 | 8.6 | 7.2 | 5.6 | 6.9 | 6.3 | 6.8 | 7.0 |
| TOTAL | 149.1 | 160.5 | 153.5 | 155.5 | 151.4 | 120.3 | 126.4 | 123.7 | 125.7 | 124.5 |

British
Columbia
Cancer
Research
Centre

# About the B.C. Cancer Research Centre



Cancer research is playing an increasingly important role in the diagnosis and treatment of the disease. Scientists at the British Columbia Cancer Research Centre work in close collaboration with the Cancer Control Agency of British Columbia, studying new drugs and treatment protocols, seeking improvements in radiation therapy and in new and innovative combinations of radiation, chemotherapy and hormonal therapy. Other scientists study the incidence of cancer in society and in the workplace to define, if possible, particular patterns in the distribution of various types of cancer amongst the general population. Still others, working in the realm of basic research, in an attempt to unravel the mystery of how and why the disease gets started in the first place, are exploring the field of molecular genetics. Many of these research protocols are winning international acclaim for our scientists and have placed the Research Centre in the forefront of cancer research in the world.

Scientific responsibilities at the Research Centre are divided amongst seven units/divisions:

## MEDICAL BIOPHYSICS UNIT

Low dose radiation studies; biological effects of ionizing radiation; improvements in radiotherapy; new combinations of radiation and chemotherapy.

## EPIDEMIOLOGY, BIOMETRY AND OCCUPATIONAL ONCOLOGY

Geographic mapping of cancer in B.C.; the epidemiology of breast cancer in B.C.; risk factors for melanoma; studies of cancer in the workplace.

## ADVANCED THERAPEUTICS

New methods of diagnosis and advances in the administration of chemotherapy; studies in the application of such immune defence modifiers as Interferon and Interleukin II.

## CANCER ENDOCRINOLOGY

The application of hormonal therapy to various cancer sites, with particular emphasis on cancer of the prostate and breast cancer.

## CANCER IMAGING

The application of computer technology to microscopy including the invention of a solid state microscope and the development of an automated cytology device to improve the efficiency and accuracy of the mass screening of cervical cells.

## TERRY FOX LABORATORY

Studies of cancers of the blood such as leukemia and lymphomas; research into bone marrow transplantation including autologous bone marrow transplants; studies in gene transfer technology.

## ENVIRONMENTAL CARCINOGENESIS

The role of the environment, lifestyles and genetics in the development of cancer. Studies into the administration of simple drugs which may inhibit the disease in major population segments.

# MEDICAL BIOPHYSICS UNIT

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Head, Radiation Biophysics
Physics/Pathology, UBC

**Dr. D.J. Chaplin**
Radiation Biology
Pathology, UBC

**Dr. R.E. Durand**
Radiation Biology
Pathology/Physics, UBC

**Dr. P.L. Olive**
Radiation Biology,
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**Dr. K.A. Skov**
Biochemistry,
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**Dr. R.O. Kornelsen**
Head, Physics Division
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**Dr. G.K.Y. Lam**
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**Dr. B. Palcic**
Physics Division,
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## POSTDOCTORAL FELLOWS

**Dr. J. Banath**
**Dr. A.I. Minchinton**
**Dr. M.J. Trotter**
**Dr. R. Yan**

## GRADUATE STUDENTS

**R. Brown**
**G. Meng**
**M. Skwarchuk**
**D. Yapp**

## OVERVIEW

This has been another productive year for the Medical Biophysics Unit with several new research projects getting underway and two new clinical protocols, based on our work, being launched at the CCABC. Our research covers a range of subjects from basic investigations into the biological effects of radiation and of chemical agents potentially useful for cancer therapy, to the clinical testing of new treatment strategies developed in our laboratories. This wide range of capabilities is essential, for example, in Dr. Skov's program of new drug development where the 'design' of a new chemical for improved radiotherapy or chemotherapy requires a knowledge of the mechanism of action of related drug types. Our close associations with the clinical divisions of Radiation Oncology and Medical Oncology and with the Section of Developmental Radiotherapy at the A.M. Evans Clinic have greatly facilitated the application and testing of new approaches to cancer treatment, suggested by our research. During the past few months, two new clinical protocols have been initiated at the CCABC, based on the tumour blood flow manipulation research of Drs. Chaplin and Acker. Both protocols utilize the drug hydralazine, which alters blood flow: in one, hydralazine will be used in conjunction with radiotherapy and benznidazole for patients with locally advanced carcinoma of the cervix and in the other protocol, hydralazine will be combined with the chemotherapeutic drug, mitomycin C for certain metastatic carcinomas and for pancreas adenocarcinoma.

In both protocols the objective is to obtain better control of oxygen deficient (hypoxic) tumour cells which are insensitive to radiation and to some chemotherapeutic drugs. In another clinical application Dr. Durand is using multicell spheroids to model the tumour response to combinations of various chemotherapeutic drugs as well as to radiation and has shown that this system may be very useful for predicting human tumour response to such combined therapies, allowing more rapid optimization of such protocols. Dr. Olive's new "comet" assay for DNA damage looks very interesting as a potential rapid assay for determining the response of individual patients' tumours to radiation or other therapy. This and some of the other important developments in our programs are described in the following

*Technician Bill Grulkey loading samples into the high performance liquid chromatograph.*

sections.

The treatment of patients at the pion therapy facility at TRIUMF is progressing well and is showing promising results for glioblastoma brain tumours and for carcinoma of the prostate. This facility was developed by the Medical Biophysics Unit and is now being operated under the direction of Dr. G.B. Goodman (see the report of the Section of Developmental Radiotherapy for more details).

Our professional staff are involved in teaching at U.B.C. where, each year, we give a course in Radiation Biophysics. As well, we give a number of lectures as part of other courses. We also supervise U.B.C. graduate students and post-doctoral fellows. At present there are 8 post-doctoral fellows and graduate students doing their research under the supervision of our staff in the Medical Biophysics Unit. This year we gave a one day Radiobiology Review Course to approximately 60 radiation oncology residents and staff from Vancouver, Edmonton, Seattle and Portland (as well as a few staff observers from London (Ont.), Saskatoon, and Winnipeg). The hosting of this course rotates annually between Vancouver, Edmonton, and Seattle.

Our staff serve on a variety of national and international scientific organizations including grant review panels, editorial boards, councils of scientific societies and a number of committees, advisory groups, etc. Dr. Peggy Olive is a member of the Radiation Study Section (grant review panel) of NIH (U.S.), she is Councilor in Biology for the Radiation Research Society and is also Chairman of the Education and Training Committee of the Radiation Research Society. Dr. Ralph Durand is Associate Editor of both Radiation Research, and Cancer Research and is Chairman of NCIC Grant Panel E. Dr. David Chaplin completes his fourth and last year as a member of the MRC cancer grant review panel. Staff members also frequently serve on site review teams to evaluate research programs at other institutions.

A very successful workshop on "DNA Targeted Radiosensitizers and Hypoxic Cytotoxins" was held in Vancouver March 16-18, 1989. This was organized by Dr. Kirsten Skov and was attended by approximately 30 participants from North America, New Zealand and Europe. It clearly demonstrated the strong interest that has developed in the potential of the new metal-containing drugs synthesized and tested by Dr. Skov and her colleagues (see the following report).

Our professional staff, post-doctoral fellows, graduate students and even some of our research assistants have presented papers at a number of national and international scientific meetings in the past year, often as invited speakers. Many distinguished scientists and oncologists from around the world have also visited our laboratories this year.

Our weekly Medical Biophysics Unit seminars have continued this year, bringing together all professional and technical staff, post-doctoral fellows and students to discuss research in progress. Dr. Martin Trotter has done an excellent job of coordinating these in the past year.

The following section briefly reviews some of the projects which are in progress at the present time. Further details can be found in the published papers of the Medical Biophysics Unit, which are listed following the research reports.

## THE "COMET" ASSAY: A NEW METHOD TO MEASURE DNA DAMAGE IN INDIVIDUAL TUMOUR CELLS

P. Olive, J. Banath and R. Durand

The response of tumours to therapy ultimately depends on the resistant non-responding cells; measuring average amounts of damage is therefore unlikely to be predictive for treatment outcome. A method first described by Ostling and Johanson in Sweden allows us to measure damage to individual tumour cells. We have modified this method and adapted video image analysis to provide a rapid and objective measure of DNA damage. Cells embedded in agarose are lysed in an alkaline, high salt solution, subjected briefly to an electric field, and then stained with a fluorescent DNA-binding dye. The individual cells or "comets" are then viewed using a fluorescence image processing system. The simplicity of the method, small sample size (fewer than 10 thousand cells are required) and speed of determination (2-4 hours) are important features of this method, but the ability to identify both responding and non-responding tumour cells is a unique feature of this DNA damage assay. Using cell sorting technology, we have been able to separate tumour cells from normal cells in the same tumour, and have measured the response of these cells to DNA damage caused by ionizing radiation and etoposide. Interestingly, the same average amount of damage is seen in both tumour and normal cells, but tumour cells show a greater range of responses.

## COMBINATION CHEMOTHERAPY STUDIES

R.E. Durand

Dr. Durand, who has used multicell spheroids and cell sorting techniques to model the biophysical properties of tumours and their response to radiation (including radiosensitizers) in the past, has extended this approach to the problem of drug "resistance" in chemotherapy. In collaboration with Dr. J. Goldie and the division of Medical Oncology he is evaluating several clinically-used chemotherapeutic agents in spheroids grown in tissue culture, particularly emphasizing regional and temporal variations in drug effectiveness. The objective is to determine when, where and why resistant cells appear in human tumours. The results are suggesting ways to use each agent more effectively, and are providing additional criteria for selecting and using combinations of drugs in the clinic.

## THE NATURE OF TUMOUR HYPOXIA AND ITS IMPLICATIONS FOR THERAPY

D.J. Chaplin, A.I. Minchinton, P.L. Olive, M.J. Trotter

As malignant cells divide within the body to form a solid tumour mass, their viability and susceptibility to therapeutic attack become dependent on the developing blood supply system within the tumour. For radiation therapy the homogeneous delivery of oxygen is of critical importance since hypoxic (oxygen deficient) cells are known to be three times more resistant to x-rays than oxic ones. For chemotherapeutic attack, delivery of the drug to all the cells within the tumour is one of the important parameters which will influence the therapeutic outcome. The question which this group has attempted to address over the last few years is how do microregions of poor blood supply arise in solid tumours?

Utilizing novel flow and static fluorescence cytometry techniques, clear evidence was obtained that hypoxia can result from transient fluctuations in microregional blood flow within the tumour mass. This finding has important implications for radiation therapy. For instance, such 'acute hypoxia' would be refractory to 'reoxygenation' using techniques designed to increase the oxygen carrying capacity of the blood.

Also, such regions, if not perfused for long periods would provide sanctuaries for cells against certain chemotherapeutic agents where tissue penetration may be limited. Thus, approaches designed to reduce or eliminate this microregional heterogeneity in tumour blood flow could have roles as adjuvants for both radiation and chemotherapy. Initial results utilizing such approaches are providing encouraging results in experimental tumour systems.

## DRUG DEVELOPMENT AND MECHANISMS

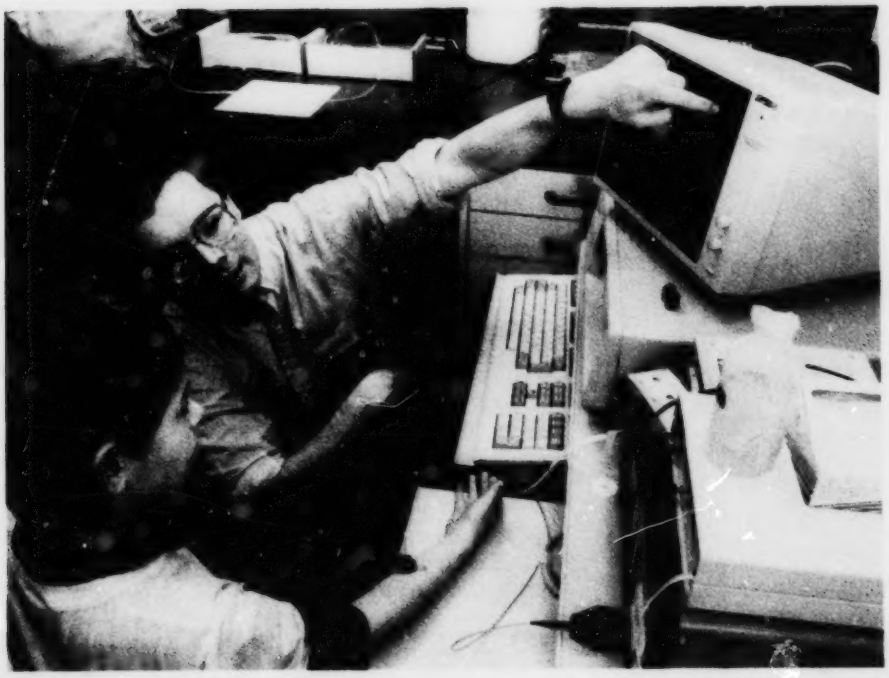
K. Skov

The general aims of Dr. Kirsten Skov's group are to develop drugs with improved properties as radiosensitizers or hypoxia selective cytotoxins, and to study mechanisms of these and existing drugs. For example, the mechanism of interaction of the chemotherapeutic agent, cisplatin, with radiation doses of clinical relevance is being studied with support of a new grant from NCI of Canada. Initial studies, carried out by Dr. Mladen Korbelik (Cancer Imaging) using the Cell Analyser, DMIPS, are being pursued by Susan MacPhail. New drugs are being developed as radiosensitizers (MRC funding) and as hypoxic cytotoxins (NCI funding) in collaboration with chemists at UBC (Drs. B.R. James and G.S. Bates) and the University of Vermont (Dr. N.P. Farrell) using various means to direct nitroimidazoles to DNA. The Ruthenium-nitroimidazole complexes synthesized by Peter Chan are less toxic but better sensitizers than the parent drugs.

Further studies in Dr. James' laboratory on related complexes are being carried out by Ph.D. candidates Don Yapp and Grant Meng, postdoctoral fellow Jaswal Jaswinder, and summer student Megan Sterling. Many of the complexes of platinum synthesized by Dr. Farrell continue to yield interesting results, particularly as cytotoxic agents potentiated by hydralazine. The U.S. patent application for these compounds has been approved. Sequence specific (non-metal) DNA binders are being used to direct certain activity to DNA by Hans Adomat who does the synthesis and characterization at UBC (Bates), assessment in cells and their effects in rodent tumours at the B.C. Cancer Research Centre.


## ACKNOWLEDGEMENTS

The Medical Biophysics Unit receives core support from the B.C. Cancer Foundation. Research operating funds were received in the form of grants from a number of sources during 1988-89: the National Cancer Institute of Canada, the Medical Research Council, the B.C. Health Care Research Foundation, the National Institutes of Health (U.S.) and the Jambor Knowledge Fund. Research Contracts were also negotiated with Roberts Pharmaceuticals and Ciba-Geigy. This support is gratefully acknowledged.

*Dr. Martin Trotter, Medical Biophysics, demonstrates the function of a Laser Doppler instrument for measuring the blood flow to Jurij Korbelik, son of Dr. Mladen Korbelik, a scientist in Cancer Imaging.*

# RADIATION PHYSICS

**R.O. Kornelsen, BSc, MSc, PhD, FCCPM**, Head, Honorary Lecturer

**R.W. Harrison, BSc, MSc**

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**B. McParland, BSc, MSc, PhD, FCCPM** (Victoria)

**L.J. Watts, BSc, MSc**

**K.F.K. Yuen, BSc, MSc, PhD**

## Major Projects

The installation and commissioning of a second simulator was completed in March and the unit is now in daily clinical use.

The upgrading of simulator number one is underway and will be complete early in the next fiscal year.

Planning for the Radiotherapy expansion, expected in the next fiscal year, is well underway with the preliminary shielding calculation and room design completed. A number of site visits have been made to assess the competing manufacturers' linear accelerators.

Replacement of the CT scanner and of the treatment planning system is still awaiting approval from Hospital Programs.

A "High Dose Rate Microselectron" will be on loan to the Agency during the next fiscal year. The unit is on site and will be commissioned for clinical use within the next two months.

## Workload Statistics

| Year | No. of patients receiving individualized planning | No. of patients for individual shielding blocks |
|---|---|---|
| 1984-85 | 1930 | 489 |
| 1985-86 | 2252 | 527 |
| 1986-87 | 2198 | 577 |
| 1987-88 | 2426 | 607 |
| 1988-89 | 2476 | 518 |

# CANCER IMAGING

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***Jack Rootman, M.D.**
***Kirsten Shov, Ph.D.**
***Hans Stich, Ph.D.**

** Academic Credentials and Clinical appointments noted elsewhere.*

**INTRODUCTION AND OBJECTIVES**

Cancer Imaging's main objective is to find a means of detection and precise localization of early cancer by employing modern sensor and computer technology. Early cancer is defined as non-invasive cancer (carcinoma in situ) and micro-invasive cancer. At present, the means by which cancer is detected is by physical examination, x-rays, endoscopy, etc. However, only relatively large tumors, larger than 0.5 cm, can be detected by these means. Using novel optical systems and solid state image sensors, detection and localization of cancers could be achieved at a much earlier stage. Numerical data provided by the sensors are analyzed by computers and this process can reveal the presence of premalignant and malignant cells.

There are two types of tasks in which modern technology can best assist people: (i) those tasks which people conduct efficiently, but are of such magnitude that humans cannot perform them without great cost and sacrifice; and (ii) those tasks which are impossible for humans to do and can only be accomplished through use of the most sensitive detectors and numerical data analysis. By such means one can detect the presence of malignancy.

Cancer Imaging's scientific staff is well equipped to tackle both categories. The Section covers a wide area of expertise ranging through mathematics, physics, mechanical and electrical engineering, biology and medicine. This type of research cannot be conducted by one or two scientists alone. Only dedicated team work of many scientists and engineers can lead to a successful final result.

Although much of our scientific work is performed as basic research, Cancer Imaging takes extra steps to develop clinically useful devices through applied, goal-oriented research. The applied research is a much more expensive and risky undertaking than basic research. Its success is measured not only by the number of scientific publications, but simply by answering the question "Does it work?".

Over the last year, Cancer Imaging has been successful in securing funding for the development of a new apparatus to be used for automated pre-screening of cervical cells. This summer, the development of another clinical apparatus has been initiated which will be used for the detection of early lung cancer. Many other new and exciting projects are already on the drawing board. However,

*A novel quantitative microscope was designed and developed to assist in the detection of cancerous cells using computer vision. Brian Pontifex is adjusting the microscope's electronic components.*

before any of these can be brought to the development stage, much more basic research must be performed.

## AUTOMATED PRE-SCREENING OF CERVICAL CELLS

The research and development of the Automated Cervical Cell Screening System (ACCESS) started in December, 1988. At that time, most of the necessary funds had been secured through venture capital funding and matching government grants. A company was formed, Microscan Imaging and Instrumentation Inc., dedicated to the development of the ACCESS device. Its purpose is to optimize the research efforts of the scientists of Cancer Imaging and to bring the product to market.

Royalties from the sales will be used by the Cancer Control Agency of B.C. to further cancer research in this and other directions. In total, over $1.7 million was raised for the program: $850,000 was provided by a grant from the National Science and Engineering Research Council (NSERC) of Canada, $450,000 came from private investors, and in June, 1989, $425,000 was awarded by the Western Diversification Fund.

ACCESS involves research into new procedures of depositing and staining cells, such that they are acceptable for computer vision, yet they do not appear different to cytotechnicians and pathologists in subsequent examinations. It involves inventing a novel, quantitative microscope which can provide large microscopic images at the theoretical resolution limits using visible light with a minimum of light loss, while processing the images and storing the processed data in a fraction of a second. It also involves research and development of new mathematical algorithms for detection of cells, cell segmentation (to find the exact boundary between the cell nucleus and the cytoplasm), and to calculate nuclear and cytoplasmic features which can be used for cell and sample classification. There are many other aspects of this research and development, too numerous to list here.

In the past year, the two most important phases of ACCESS have been successfully achieved. These are the completion of the conceptual design, theoretical calculations, and the building of a laboratory prototype of the solid state microscope (SSM), and the development of algorithms which can be used in the microscope's fully automated mode to segment cells into nuclear and cytoplasmic areas. The preliminary data reveal that cell recognition and cell segmentation can indeed be performed with great fidelity and with virtually no failure, irrespective of the cell type.

*Minute perturbations of live cells by oscillating magnetic fields can be measured by equipment developed by Cancer Imaging's scientists and engineers. A summer student, Sion Jao, is preparing the equipment for an experiment.*

A team of engineers, headed by Bruno Jaggi, P. Eng., and including Steven Poon, P. Eng., John Fengler, Ma.Sc., Brian Pontifex, Alan Harrison, and Evan Hobenshield, have succeeded in implementing the ideas of several years of research. The first images from the SSM were "seen" by computers on April 25th, 1989. The device has since been granted a U.S. patent, and is now patent pending in many other countries in Europe, Japan and Canada. A great amount of interest has already been generated with the SSM and it is now believed that scientists will be able to use it in experimental settings by the end of this year.

Calum MacAulay, M.Sc., and Haluk Tezcan, M.D., graduate students of Physics and Pathology, respectively, are responsible for the successful implementation of the ideas of cell segmentation, feature extraction and statistical analysis, allowing classification of cervical cells into normal, pre-malignant and malignant types.

## DETECTION OF EARLY LUNG CANCER

The other exciting development in Cancer Imaging is a new lung cancer detection device, Lung Imaging Fluorescence Endoscope (LIFE). This apparatus will be used for routine lung examination of individuals who are suspected of having early lung cancer. Drs. Stephen Lam and Branko Palcic are investigating the use of drugs that, preferentially, are retained in tumors and which also fluoresce. They propose to build a device which will detect the faint fluorescence from normal and malignant tissues and to use this information to image otherwise invisible cancers. Several light sensitive drugs have been tested and the majority have produced excellent results. The most promising outcome of this research is the finding which suggests that the difference in fluorescence between normal and cancerous tissue, even without any drugs, is large enough that it can be used for detection of early lung cancer. A simple device which can be added to a conventional bronchoscope is being designed so that it will be possible to detect minute non-invasive cancers. This will be done by superimposing previously calculated fluorescent images onto video images from the bronchoscope.

Dr. Mladen Korbelik and Jaclyn Hung, a graduate student in Physics, have been investigating how best to exploit fluorescent drugs to maximize their fluorescent signals, as well as how to use drugs such as hematoporphyrin for subsequent eradication of early lung cancer using photodynamic therapy.

## OTHER COLLABORATIVE PROJECTS

There are many other research projects carried out by scientists of the B.C. Cancer Research Centre. These are mostly collaborative projects with scientists of different universities and laboratories in B.C. and Canada., as well as other countries of the world. Cancer Imaging has built an arsenal of sophisticated research tools which can be employed in cancer and other related research.

# DEVELOPMENTAL RADIOTHERAPY

**G.B. Goodman, FRCPC, FRCP (Edin), FRCR, FACR**, Head, Clinical Professor (Surgery)

**J.L. Bowen, MD, FRCPC**, Clinical Fellow - TRIUMF

**Y. Ogawa, MD**, Clinical Fellow - TRIUMF

## PARTICLE RADIOTHERAPY AT TRIUMF

(In cooperation with Dr. E. Vogt, Director, TRIUMF - UBC; Dr. L. Skarsgard, Head, Medical Biophysics, BCCF)

### Pion Radiotherapy at TRIUMF

The first prospective randomized trial in the world to evaluate pions vs photons was launched in June 1988. The study involving patients with glioblastoma multiforme is proceeding well and patient accrual should be complete in about two to two and a half years' time.

Just over 200 patients have so far been treated with pion radiotherapy at TRIUMF. Most tumours were located in the brain and pelvis.

In his research project Dr. Y. Ogawa, visiting TRIUMF Clinical Research Fellow, has been investigating the potential therapeutic gain for pions using two kinds of animal tumour models. The adjuvant use of a biological response modifier, Schizophyllon (SPG), has been studied in its capacity to delay time to recurrence of tumours. The studies show that pion treatments are of greater benefit in moderately slow growing tumours (SCC VII) with hypoxia and with fractionated treatments whereas the KHT sarcoma, a rapidly-growing tumour, showed little effect. The immunomodulator SPG produces an enhanced growth delay in one tumour model (SCC VII) with reduction in pulmonary metastases. This suggests new horizons for combination therapy in that pions can control the local tumour with minimal residue and thereby allow the immunomodulator to maximize its effect.

### Proton Beam Therapy

Specifications for a proton beam facility at TRIUMF for radiosurgery of intracranial tumours and for malignant tumours of the eye will be finalized soon. A proposal will be drafted for funding of a detailed design study.

## HYPOXIC CHEMO SENSITIZATION AND TUMOUR BLOOD FLOW

(Dr. B. Acker, Dr. C. Ludgate and Dr. D.J. Chaplin)

Tumour blood flow has been depleted using the vasodilator drug called hydralazine. Clinical tests by Dr. B. Acker in patients undergoing radiotherapy for cancer of the cervix have shown the drug to be well tolerated with appropriate scheduling.

Dr. C. Ludgate has demonstrated the tumour blood flow reduction from hydralazine in a brain tumour using positron emission tomography scanning.

Further work at the clinical level is delayed pending the availability of supplies of the hypoxic cell cytotoxin, viz. benznidazole.

## STAFF

Dr. Julie Bowen joined us in January 1989 as TRIUMF Fellow replacing Dr. Rheaume who has received a staff appointment in the Division of Radiation Oncology, CCABC.

In June 1988 Dr. Y. Ogawa who is Associate Professor and Deputy Director, Department of Radiology at Kochi National Medical School joined us for a research year. It is anticipated that another TRIUMF Fellow, Dr. Y. Takai, will arrive from Japan in September 1989.

# ENVIRONMENTAL CARCINOGENESIS UNIT

## STAFF

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**Drs. J. Payne and S. Ray**
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*India:*
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Regional Cancer Centre, Trivandrum

**Dr. B.B. Parida**
Utkal University
Bhubaneswar

*Japan:*
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National Cancer Center Research Institute, Tokyo

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**X. Yin, M.Sc.**
Kinesiology, SFU

**L. Zhang, M.Sc.**
Kinesiology, SFU

## RESEARCH PROJECTS

### MAINTENANCE OF A CHEMOPREVENTIVE EFFECT

Dr. H.F. Stich and Drs. B. Mathew, R. Sankaranarayanan and M. Krishnan Nair (Regional Cancer Centre, Trivandrum, India)

Current interest in the use of carotenoids and retinoids as chemopreventive agents is based on their antimutagenic, anticlastogenic and anticarcinogenic actions in a great variety of test systems, on investigations showing a higher incidence of cancer in vitamin A- or beta-carotene-deficient individuals, and on several clinical intervention trials. Despite many positive results, there remain a host of unresolved issues before a routine administration of retinoids and carotenoids to human groups at elevated risk for cancer can be initiated or the supplementation of their diets can be recommended. In particular, the administration of chemopreventive agents to tobacco chewers, snuff dippers and cigarette smokers would require a profound understanding of economical distribution methods of retinoids or carotenoids to millions of individuals who are exposed to excessive levels of cancer initiating and cancer promoting agents. An other critical issue is the behaviour of a tissue following termination of treatment. During the last couple of years we have focused our attention on the question of whether the normalization of a treated preneoplastic tissue, which has been achieved through the administration of heavy doses, can be maintained for a prolonged time period by exposure to lower, non-toxic doses of a chemopreventive agent.

The current studies revealed a few points of practical interest. A reduction in the frequency of micronucleated mucosal cells, the remission of oral leukoplakias, and the inhibition of new leukoplakias was obtained through the twice-weekly administration of beta-carotene, vitamin A, or both, despite the continuous chewing of tobacco and areca nuts by the trial participants. Thus the doses of chemopreventive agents used were able to exert a protective effect against the cancer initiators and/or promoters which are released into the saliva of betel quid chewers for several hours each day. Similarly, the lower levels of vitamin A and beta-carotene which were used as maintenance doses were able to convey a protective effect for a prolonged period after the original treatment had ceased. Considering that the chemopreventive actions can be prolonged by lower maintenance doses, the possibility should be explored whether the alternation of short-term 3 to 6-month treatment periods with approximately 4 months without treatment could convey a protective effect without causing undesirable side-effects.

**Mechanisms of Retinoid Action**

The mechanisms by which vitamin A conveys a chemopreventive effect are still unknown. A better understanding of these mechanisms may help in the design of more effective treatment protocols. To find answers to this unresolved issue, we have initiated several projects.

**Promoting Activity of Betel Quid Ingredients**

Dr. H.F. Stich
and Dr. S.S. Tsang

Ingredients of betel quids, which have been linked to the high incidence of precancerous oral lesions and oral cancers, were examined for their promoting activity. Aqueous extracts were tested using the bovine papillomavirus (BPV) DNA transformation assay, which consists of cultured C3H/10T1/2 cells transfected with the plasmid pdBPV-I as targets, and the frequency of transformed foci as endpoints. Areca nut extracts enhanced the formation of BPV DNA-induced transformed foci approximately tenfold and threefold, respectively. Of particular interest was the observation that the addition of retinol to the areca nut extracts inhibited its tumour promoting effect in a dose-dependent manner, completely abolishing the promoting activity at a dose of $10^{-6}$M.

These studies suggest that the administration of vitamin A, which prevented the development of new precancerous lesions in the oral cavity and induced the remission of established oral leukoplakias in tobacco/areca nut chewers, may be due to inhibition of the promoting activity of the areca nut rather than to the inhibition of cancer initiation.

**Quantitation of Chromatin Patterns by Image Analysis as a Predictive Tool in Chemopreventive Trials with Vitamin A**

Dr. H.F. Stich
and Dr. B. Palcic
(Cancer Imaging Section)

The difficulty of using the frequency of cancer as an endpoint in chemopreventive trials has led to a search for markers which can provide early information on the response of a tissue to the administration of chemopreventive agents. In this study, we explored the feasibility of using two parameters of nuclear chromatin distribution (variance of intensity and entropy) as markers. As subjects, we chose at random five tobacco/areca nut chewers from 21 participants of a chemoprevention trial with vitamin A. Changes in nuclear textures accompanied the vitamin A treatment, including a significant reduction in the variance of intensity and entropy. Four months after termination of vitamin A administration, cells with condensed chromatin started to reappear in four of the five chewers. Their texture features resembled those found in the nuclei of leukoplakias before the onset of vitamin A treatment. In this connection, it is of interest to note that at this stage no signs of leukoplakia were detectable by oral examination. These results may indicate that nuclear texture changes could conceivably predict the loss of preventive activity of the original vitamin A treatment. This study on five betel quid chewers shows that nuclear texture analysis of a small subpopulation taken from participants of a large scale chemopreventive trial should suffice to reveal the response of a tissue to the action of the chemopreventive regime. In

**Table 1**

| Subject | Treatment | Remission/ Reduction/ Improvement | Approximate Times of Recurrence |
|---|---|---|---|
| Oral leukoplakia | 13-cis-retinoic acid | 54% patients | 2-3 months |
| Oral leukoplakia | Vitamin A | 57% patients | 3 months |
| New skin cancers (xeroderma pigmentosum) | Isotretinoin | 63% cancer | 1 year observation |
| Neoplastic human cells (in vitro) | Retinol, retinoic acid | Growth pattern | Several days |
| Murine melanomas (in vitro) | all-trans-retinoic acid | Proliferation | 2-3 days |
| C3H/10T1/2 cells | Beta-carotene | Cell transformation (3-methylcholanthrene) | 2 weeks |
| Shope rabbit papilloma | Vitamin A | Delays initiation | Several months |

References: Hong et al., 1986; Stich et al., 1988; Kraemer et al., 1980; Azuma et al., 1988; Lotan et al., 1978; Pung et al., 1988; McMichael, 1965.

addition, the significant changes in variance of intensity and entropy obtained by analyzing less than 50 nuclei demonstrate the high resolution power of the image analysis procedure.

**Action of Retinol on the Hydroxylation of DNA from the Oral Mucosa of Tobacco/Areca Nut Chewers**

Dr. H.F. Stich, Dr. H. Kasai, and Dr S. Nishimura (National Cancer Center Research Institute, Tokyo, Japan)

8-Hydroxydeoxyguanosine (8-OH-dG), which is caused by exposure to various oxygen radical producing agents, was estimated in DNA samples from normal oral mucosa, precancerous oral lesions and oral cancers from tobacco/areca nut chewers. The preliminary results indicate that some DNA samples from precancerous lesions show higher levels of 8-OH-dG compared to control specimens. Currently, we are examining whether treatment with vitamin A, which induces remission of the precancerous lesions, will reduce the levels of 8-OH-dG produced in the oral mucosa by ingredients of the chewing mixture. Our results should yield information on the capacity of retinoids to interfere with initiation events of carcinogenesis in man.

**Effect of Retinoic Acid on BPV DNA-Induced Cell Transformation, Gene Expression of Transformed Cells, and Copy Number Maintenance of BPV DNA**

Dr. S.S. Tsang

Papillomaviruses can induce both benign and malignant tumours in animal species. Papillomavirus infection is suspected of playing an etiological role in human cancer, including oral and cervical cancer. About 60-90% of cervical carcinomas harbour papillomavirus DNA sequences. Retinoids have been used as chemopreventive and chemotherapeutic agents for papillomavirus-containing lesions. We have studied the effect of retinoids on mouse cells transformed by bovine papillomavirus DNA (BPV DNA).

Neoplastic transformation was induced in mouse cells by transfection with BPV DNA. Transformed cells were found to contain 20 to 100 copies of the BPV DNA. Retinoic acid (RA) (vitamin A acid) was found to exert an inhibitory effect on BPV DNA-induced cell transformation. Prolonged treatment with RA eliminated the BPV DNA from the mouse cells, and the cells lost their ability to form transformed foci.

The results suggest that the presence of papillomaviruses is required for both the induction and maintenance of the transformed phenotype. Retinoic acid has an inhibitory effect on the copy number maintenance of BPV DNA in mouse cells. We have provided supportive evidence of the usefulness of retinoids as chemopreventive and chemotherapeutic agents in papillomavirus-related cancer. The effect of RA on viral and cellular gene expression is currently under investigation.

**Enhancement of Papillomavirus DNA-Induced Cell Transformation by Tumour Promoters**

Dr. S.S. Tsang

Besides papillomavirus infection, exposure to other environmental agents may be necessary to induce neoplastic changes in infected tissues. Among these environmental agents are tumour promoters, which enhance the frequency of virally- and chemically-induced tumour formation in animals.

Our results indicate exposure to tumour promoters as additional factors in the development of papillomavirus-associated cancer. The establishment of a tumour promoter-dependent cell transformation system should facilitate investigations into the cellular and molecular mechanisms by which tumour promoters enhance BPV DNA-induced cell transformation. We hope to identify the cellular genes which may cooperate with BPV genes in the neoplastic transformation of mammalian cells.

**Development of an In Vitro Assay for Tumour Promoters and Chemopreventive Agents**

Dr. S.S. Tsang, Dr. H.F. Stich, Dr. H. Fujiki (National Cancer Center Research Institute, Tokyo, Japan) and Dr. E. Hecker (German Cancer Research Centre, Heidelberg, FRG)

As a cooperative project, we will determine the spectrum of tumour promoters and anti-promoters that can be detected by our cell transformation system. We will explore ways in which to increase the sensitivity and shorten the time of the assay.

*Postdoctoral Fellow, Bahram Sadaghiani, observes the growth of cultured neural crest cells used in the study of normal and tumorous pigment cell development.*

**Cellular Defences Against Oxygen Toxicity**
Dr. Miriam P. Rosin

Life cannot be supported without oxygen. However, it is known that during normal cellular metabolism, oxygen can react to produce toxic compounds. These products are termed reactive oxygen species (ROS).

A research team comprised of Dr. M. Rosin, graduate students A-M. Gilbert, M. Yi and A. Ward, and undergraduate students C. Anderson and I. Csontos, has been exploring the effects of ROS on human cells in the laboratory. They have been using cells cultured from skin samples obtained from two groups of individuals: normal individuals from the general population, and individuals belonging to a genetic syndrome called ataxia-telangiectasia (A-T). Patients with A-T are at elevated risk for development of cancer (100-fold increase in frequency). Although the number of individuals with A-T is relatively small (1 in 20,000 people), a substantial number of people are carriers of the syndrome (5 in 100 people) as heterozygotes. Carriers have one affected chromosome and one normal chromosome, whereas A-T patients have two affected chromosomes. These carriers are also at risk for cancer; for example, 20% of breast cancer patients may be carriers of the A-T gene. Although A-T patients can be clinically identified, we are currently unable to distinguish carriers in the general population. DNA probes for the A–T gene are now being developed.

**Measurement of Genetic Damage from Environmental Chemicals**
Dr. Bruce P. Dunn

Using newly developed, highly sensitive assays, research is being conducted on genetic damage caused by environmental carcinogens. The procedures used detect and quantitate DNA-carcinogen adducts caused by the covalent binding of carcinogenic chemicals or their metabolites to DNA bases. Such adducts are believed to be an obligatory intermediate in the mechanisms by which carcinogens cause cancer. The methodology used can detect as little as 1 modified DNA base in a billion normal bases, using tissue samples as small as 10 mg.

In conjunction with Drs. J. Payne and S. Ray of the Department of Fisheries and Oceans in St John's, Newfoundland, we have begun to examine genetic damage in beluga whales and seals from remote areas and from potentially contaminated harbour and river areas. Unexpectedly, samples from even remote areas showed substantial levels of genetic damage. The origin of the chemicals causing this background damage is not known at the moment. To date we have not seen any elevation in the level of genetic damage in samples from urbanized or industrialized areas.

**Fish Melanoma and Cell Development**
Dr. Juergen R. Vielkind

Melanoma mortality rate is exceeded only by that of lung cancer in North America. It is therefore necessary to investigate this cancer at all levels. We have been studying a genetically caused melanoma in an animal model at the molecular as well as cellular level. Having identified several genetic loci mediating melanoma formation, a complex locus was identified which not only appears to behave in an oncogenic manner, but under certain circumstances, also in an anti-oncogenic manner. Interestingly, this complex locus also contains a tyrosine kinase-related gene (many oncogenes belong to this gene class); so far, it has been found to be expressed only in melanomas and in a melanoma-derived cell line. The study of the function of this gene in normal and melanomatous pigment cell differentiation will be a major endeavour in the near future.

*Research Assistants, Barbara Schmidt and Bruce Woolcock, explain to Seema Singh (centre) procedures used to isolate cancer-causing genes. Ms Singh, a student from Princess Margaret School in Surrey, is spending one month in the Environmental Carcinogenesis Unit to gain valuable work experience through the Cooperative Education Training Plan.*

Research staff involved in these studies include post-doctoral fellow, Dr. Bahram Sadaghiani, research assistants, Barbara Schmidt and Bruce Woolcock, and graduate student Samuel Chong. Our fish are cared for by Doreen Low. We gratefully acknowledge support from the B.C. Cancer Foundation, the Medical Research Council of Canada, and the National Institutes of Health (USA).

**Role of Active Oxygen in Cellular Genotoxicity**
Dr. Allan J. Davison

Normal people have synergistic systems and powerful defenses against active oxygen. In collaboration with Drs. Siu Sing Tsang and Hans Stich, a research team comprising Dr. Allan Davison, Dr. Jim Moon, and graduate students Brian Bandy, Xuefeng Yin, Eunice Rousseau, Dolores Fatur, Luoping Zhang, Don Steele and Anna Li, is studying biochemical defenses against active oxygen. The group has studied genotoxicity in terms of damage to isolate DNA, mutations and chromosomal damage in cultured cells. Graduate students have studied (1) cellular responses to oxidants and antioxidants as pro- and anti-carcinogens, (2) damage to DNA and other cellular components in vitro and in vivo, and (3) epidemiological studies of groups that may be at elevated risk for cancer at SFU, northern B.C., Alberta and Saskatchewan. The focus of the research is the roles of pro- and anti-oxidants in oxygen-mediated genotoxicity and cytotoxicity.

The anti-cancer effects of beta-carotene result either from its ability to protect against free radical tumour promoters or from its vitamin A activity. This independent action of beta-carotene may result from anti-oxidant activity, but this is difficult to assess in test-tube studies. One difficulty is that the activity of beta-carotene varies with concentration of oxygen. Eunice Rousseau has confirmed that it is at the low pressures of oxygen which occur inside living cells that beta-carotene becomes most effective as an anti-oxidant.

Graduate students Luoping Zhang and Eunice Rousseau are researching anti-oxidant defenses against the instability of chromosomes and cellular membranes to tumour promoters. The group seeks to learn what interactions between dietary anti-oxidant vitamins, tissue components and minerals provide optimum protection against tumour promoters, what factors increase or decrease human requirement for dietary anti-oxidants, the roles of genetics and environment in delivery of anti-oxidants to tissues, whether exposure to carcinogens or promoters increases the requirement for dietary anti-oxidants, and whether chromosomal instability disorders can be ameliorated by anti-oxidants.

Figure 1

**Protection of vitamin A (50,000 IU/week) given as a maintenance dose following the administration of beta-carotene (180 mg/week) and vitamin A (100,000 IU/week). The frequency of micronucleated oral mucosal cells was used as an endpoint, and 61 chewers of tobacco-containing betel quids were used as participants in the trial.**

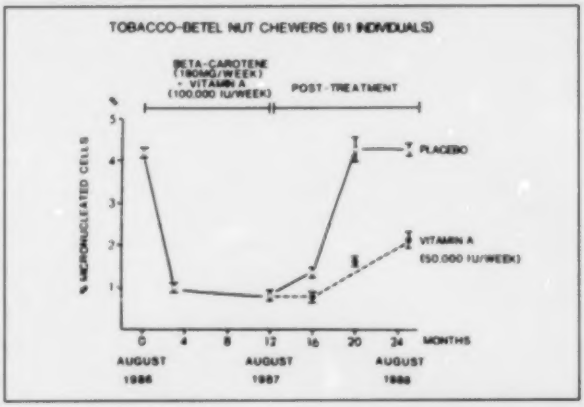
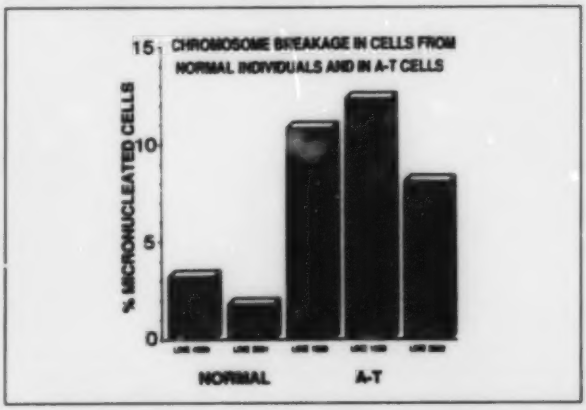



Figure 2

**Chromosome breakage in cells exposed to hydrogen peroxide. Cell cultures are from normal individuals and from patients with ataxia-telangiectasia**



# TERRY FOX LABORATORY

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Associate Member, Terry Fox Laboratory; Clinical Hematologist, CCABC and VGH; Director, B.C. Leukemia/ Bone MarrowTransplantation Program; Associate Professor, Department of Medicine, UBC.

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Associate Member, Terry Fox Laboratory; Clinical Hematologist, CCABC and VGH; Deputy Director, B.C. Leukemia/Bone Marrow Transplantation Program; Clinical Assistant Professor, Department of Medicine, UBC. Sabbatical Visitor

## SABBATICAL VISITOR

**B. Swolin, M.D. (Gothenburg, Sweden), Ph.D. (Gothenburg, Sweden)**
Associate Professor and Hematopathologist, Department of Clinical Chemistry, Gothenburg University, Gothenburg,

## POSTDOCTORAL FELLOWS

**M. Alai, Ph.D.**
Fellow/Staff Member, SFU

**S. Baindur, Ph.D.**
NCI Grant Funded

**J. Cashman, Ph.D.**
NCI Grant Funded

**P. deVries, Ph.D.**
Cancer Research Society Fellow

**G. Dougherty, Ph.D.**
NCI Grant Funded

**S. Dougherty, M.B., Ch.B.**
NCI Fellow

**P. Hughes, M.D., FRCP(C)**
Terry Fox Fellow

**R. Kay, Ph.D.**
MRC Fellow

**C. Kelleher, Ph.D.**
NCI/MRC Grant Funded

**H. Klein, M.D.**
Deutsche Forschungsge Fellow

**F. Kohn, Ph.D.**
BCHCRF Grant Funded

**T. Otsuka, M.D.**
Terry Fox Fellow

**C. Schmitt, Ph.D.**
INSERM Fellow

**H. Sutherland, M.D., FRCP(C)**
Terry Fox Fellow

**T. Thomas, M.D., Ph.D.**
BCHCRF Grant Funded

**A. Turhan, M.D., CES**
MRC Fellow

**C. Udomsakdi, M.D.**
Cancer Research Society Fellow

**C. Vissinga, Ph.D.**
MRC Grant Funded

**B. Wognum, Ph.D.**
NCI Grant Funded

**S. Wong, Ph.D.**
MRC Grant Funded

## GRADUATE STUDENTS

**C. Carpenito**
Ph.D. Student
Genetics, UBC
MRC Studentship

**H. Dickeson**
Ph.D. Student
Pathology, UBC
NCI Grant Funded

**A. Feuchter**
Ph.D. Student
Genetics, UBC
NCI Studentship

**C. Fraser**
Ph.D. Student
Genetics, UBC
NCI Studentship

**N. Goodchild**
Ph.D. Student
Genetics, UBC
MRC Studentship

**K. Horley**
Ph.D. Student
Microbiology, UBC
NSERC Studentship

**A. Mui**
Ph.D. Student
Pathology, UBC
MRC Studentship

**N. Poulin**
Ph.D. Student
Physics, UBC
NCI Grant Funded

**S. Szilvassy**
Ph.D. Student
Microbiology, UBC
NCI Studentship

**D. Thacker**
Ph.D. Student
Genetics, UBC
UGF Studentship

**D. Wilkinson**
Ph.D. Student
Genetics, UBC
MRC Studentship

## OVERVIEW

The primary goal of the research undertaken in the Terry Fox Laboratory is to improve the diagnosis and treatment of leukemia and related types of cancer. To achieve this, a multi-disciplinary group of laboratory cancer researchers and physicians have been brought together under one administrative structure. Thus advances made in the laboratory can be moved quickly into the clinic. Conversely, patient blood and marrow specimens needed for laboratory research are readily available. The net result is that progress in both the clinic and in the laboratory can be made more rapidly.

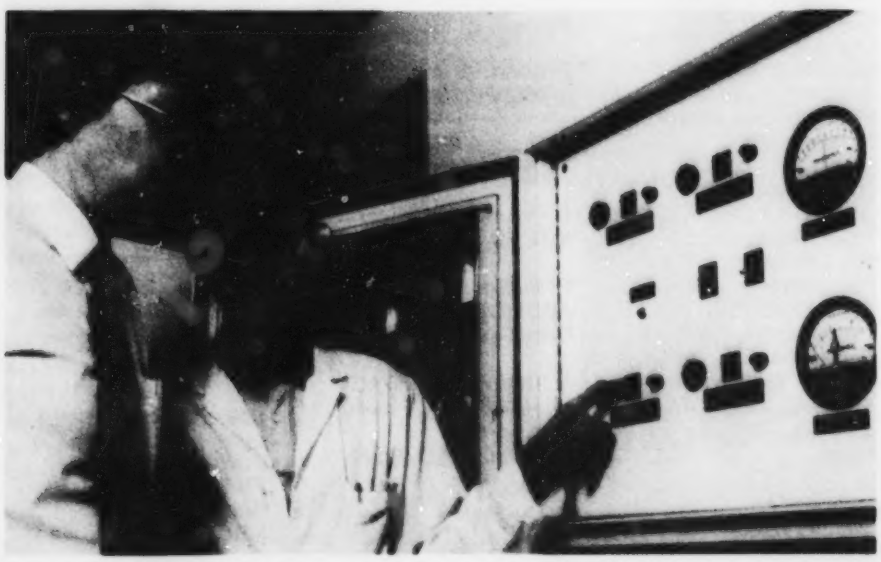
A notable example is the promising first clinical application of a new approach to the treatment of chronic myelogenous leukemia based on a discovery made in the Terry Fox Laboratory in 1982. The discovery was that under certain tissue culture conditions that stimulate the growth of normal blood cells, leukemic cells die. Thus incubation of marrow cells from patients with leukemia under appropriate conditions provides a method for the selective removal of leukemic cells, thereby making possible the use of such incubated marrow for autologous bone marrow transplantation.

Other advances have been made in understanding the regulation of normal and leukemic cell growth, in the development of methods for making specific changes in the genetic make-up of human blood-forming cells and in analyzing how to generate cells that may help fight against cancer within the body. A more detailed description of current areas of activity and scientific achievements during the last year is provided in the latter sections of this report.

A major part of the funding for the research done by the more than 80 people now working in the Terry Fox Laboratory comes from a prestigious 5 year Group grant from the National Cancer Institute of Canada. Significant support has also been received from the Medical Research Council of Canada, the British Columbia Health Care Research Foundation, the British Columbia Medical Services Foundation (administered through the Vancouver Foundation), the Cancer Research Society and from Ortho Pharmaceuticals.

Several Senior Staff hold competitive career awards for partial salary support from the national agencies of the National Cancer Institute and of the Medical Research Council. Salary support for the other Senior Staff is provided by the Cancer Control Agency of British Columbia, Vancouver General Hospital, BC Children's Hospital and University of British Columbia. A large and important group in terms of research productivity are the 37 postdoctoral fellows, graduate students, and summer students who have worked on projects in the Terry Fox Laboratory during the last year . Twenty of these individuals have also obtained their own full-time salary support in the form of competitive independent awards from outside agencies, including the National Cancer Institute, Medical Research Council, National Science and Engineering Research Council, University of British Columbia, L'Association pour la Recherche contre le Cancer (France), and the Cancer Research Society.

Teaching is also a vital part of cancer research, especially in view of recent governmental projections of increasing numbers of cancer patients and insufficient numbers of trained biomedical investigators in the near future. Most graduate students in the Terry Fox Laboratory are enrolled either in the Genetics Program, the Experimental Pathology Program or the Department of Microbiology of the University of British Columbia. The Senior Staff of the Terry Fox Laboratory have organized, with the assistance of other staff in the BC Cancer Research Centre, a joint graduate and undergraduate level course called Oncogenetics at the University of British Columbia. Dr. Dixie Mager now serves as the Co-ordinator for this very popular course which provides an introduction to the rapidly evolving field of cancer cell biology and genetics. In addition a number of University-accredited seminar courses are also offered within the Terry Fox Laboratory itself.



*Dr. Allen Eaves and Dr. Keith Humphries examining the air handling control system for the recently completed Level III Gene Transfer Laboratory. This special facility will allow advanced studies to be carried out on the role of growth factors and oncogenes in the regulation of cell growth and differentiation as it relates to cancer. The $221,000 necessary to construct this laboratory was gratefully received from a number of sources including Mr. & Mrs. Joseph Cohen & family in the name of Dr. G. John Ankenman, the P.A. Woodward Foundation, the Order of the Eastern Star, the University of British Columbia, and the B.C. Cancer Foundation.*

An important development has been the construction of the long awaited Level III/Gene Transfer Facility (see photo). Most of the funding for this facility is being provided by generous donations from Mr. & Mrs. Joseph Cohen & family in the name of Dr. G. John Ankenman, the Mr. and Mrs. P.A. Woodward Foundation, the Order of the Eastern Star, and the B.C. Cancer Foundation. Some additional funds have been provided by the Faculty of Medicine and the Faculty of Graduate Studies of the University of British Columbia. The facility has been carefully designed to provide the desired level of containment for genetically engineering human cells in the laboratory. Goals of this work are to determine the function of specific regulatory elements encoded by certain human genes and to assess the value and feasibility of modifying the genetic make-up of human cells. The new laboratory will also provide expanded facilities for laboratory manipulation of marrow transplants including gene therapy protocols being planned in conjunction with the Bone Marrow Transplant Program under the direction of Dr. Gordon Phillips. Funds to equip the facility are currently being sought.

This last year a number of other projects have been undertaken. Income from the Media Preparation Service (see photo) was used to construct a study room for students and postdoctoral fellows. This has been most important in allowing accommodation of a rapidly expanding number of trainees whose dedication and drive is central to any cancer research program.

The Senior Staff have had a busy and productive year in terms of invited lectures, publications and attendance at national and international meetings. Many of the Senior Staff also serve on peer-review grants panels including those of the National Cancer Institute, the Medical Research Council, the B.C. Health Care Research Foundation, and the Canadian Red Cross, as well as the National Institutes of Health (NIH) in the United States. Several of the Senior Staff are also Associate Editors or members of editorial boards of various international journals.

**CRYOGENIC LABORATORY**
Dr. P. Lansdorp

The most primitive "stem" cells of the blood-forming system are responsible for maintaining a continuous output of mature blood cells throughout adult life. Recent studies have shown that the stem cells present in the bone marrow of mice can be purified to near homogeneity. Purified human hemopoietic stem cells would theoretically offer enormous potential for bone marrow transplantation (BMT) as many of the complications of BMT are related to the presence of non-stem cells in the bone marrow transplant. The availability of pure stem cells would also make possible crucial studies of stem cell biology and gene therapy.

Studies in the Cryogenic Laboratory are focussed on the purification and characterization of human hemopoietic stem cells and are directed at three specific aims. The first is to develop small scale stem cell purification procedures using flow cytometry and cell sorting. The second aim is to establish both small and large scale stem cell purification procedures using immunoabsorption techniques. The third aim is to define culture conditions that allow the short-term survival, activation and proliferation of stem cells. Taken together these studies in complementary areas of stem cell biology will provide technology that is directly applicable in the Bone Marrow Transplantation Program in Vancouver and that should help to improve our understanding of the fascinating biology of the blood-forming stem cells.

*Patty Rosten, a technologist working with Dr. Keith Humphries in the Molecular Genetics Laboratory, prepares to electroporate a sample of cells. This apparatus passes a high electrical current through a cell population which opens pores and allows cells to take up short strands of DNA. Using this method, DNA sequences coding for growth factors (growth factor genes) can be introduced into cells and their effects tested on subsequent cell growth. A growing body of evidence suggests that growth factors are extremely important in controlling the growth of normal cells, and that cancer cells which multiply uncontrollably have lost their responsiveness to these growth factors.*

## CELL CULTURE LABORATORY
Dr. C. Eaves

The Cell Culture Laboratory has pioneered the development of culture systems that support the proliferation and differentiation of primitive human blood cell precursors. Using these systems it has been possible to define how early normal blood cells develop in the bone marrow and to learn where abnormalities occur in some of the leukemias. The most primitive hemopoietic progenitor cells are pluripotent and have extensive self-renewal capacity. We have recently shown that one human marrow stem cell is sufficient to produce all of the blood cells present for several months. In addition, these primitive cells normally alternate between a resting and an actively dividing state. These cells are also the usual target of mutagenic events that cause leukemia. The research interests of this laboratory are presently focussed on analyzing the molecular interactions that regulate normal and neoplastic stem cell self-renewal and differentiation.

## BIOCHEMISTRY LABORATORY
Dr. G. Krystal

Mature blood cells (i.e. red blood cells, platelets and white blood cells) have finite life spans in the blood stream and are constantly being replenished from a pool of primitive stem cells located in the bone marrow. The number of mature blood cells produced each day is determined by stimulatory and inhibitory factors that are synthesized in greater or lesser amounts depending on the needs of the body.

In order for these factors to stimulate or inhibit cell division, they must first bind to specific cell surface receptors on target cells. Recently, interest in these factors and their receptors has increased dramatically because of growing evidence that cancers result from DNA mutations that lead either to the abnormal production of these factors, the presence of abnormal receptors on cell surfaces, or production inside cells of abnormal intermediates which allow the cell to divide uncontrollably.

Studies in the Biochemistry Laboratory are concerned with characterizing these regulatory factors and examining their effects at the molecular level on normal and abnormal blood cells. We have now learned a great deal about the structure of the interleukin-3 receptor and hope soon to be able to understand the function of this molecule in greater detail.

*Dr. Colm Kelleher, a postdoctoral fellow with Dr. Dixie Mager, looks over the shoulder of Nancy Goodchild at a DNA slot blot held by Dean Thacker. Both Nancy Goodchild and Dean Thacker hold prestigious University Graduate Fellowships from the University of British Columbia. Advances in molecular biology over the last decade are resulting in improved molecular diagnostic techniques to facilitate the early detection and classification of different types of cancer. Retroviral-like sequences that occur normally in human genetic material are being explored for their diagnostic usefulness in the Terry Fox Laboratory.*

## LEUKEMIA LABORATORY
Dr. A. Eaves

Blood cell cancers include a large variety of diseases, including many different types of leukemia, lymphoma and myeloma. These cancers differ in the patient age group in which they are most often seen, and in the type of therapy to which they are likely to respond. They also differ in a number of more fundamental biological parameters. These include the type of blood precursor cell initially transformed, the oncogenes involved, altered responses to growth regulators and the capacity of the malignant cells to be redirected into a normal behaviour pattern.

The research objectives in the Leukemia Laboratory are to develop systems that will allow these features of leukemic hemopoiesis to be reproduced, analyzed and eventually manipulated under defined conditions. Currently there is much excitement over the initially promising results obtained with "culture-purged" autologous bone marrow transplantation in chronic myeloid leukemia.

This is a clinical trial being carried out jointly with the Bone Marrow Transplant Program of the CCABC and is based on our discovery that marrow from such patients can be selectively depleted of leukemic cells if cultured under appropriate conditions, without the use of toxic drugs.

## CYTOGENETICS LABORATORY
Dr. D. Kalousek

Chromosomal changes play an integral part in the development of most blood cell cancers. Both in leukemia and lymphoma, the correlation between the malignant cell phenotype and a specific chromosomal abnormality is recognized.

The focus of the Cytogenetics Laboratory is to understand the stage in the evolution of a leukemic clone at which chromosomal changes occur, the cell type in which these first take place, and possible associations with subsequently manifested changes in growth and differentiation.

A method for harvesting tiny individual colonies of developing blood cells produced in tissue culture has been developed in this laboratory. This has revolutionized our ability to study particular cell types and to obtain much more precise information about chromosomally abnormal cells in patients with leukemia. We are now devot-

ing most of our efforts to a joint clinical trial using "culture-purged" autologous marrow transplants to try to achieve cures in patients with chronic myelogenous leukemia, where cytogenetic evaluation of the cells is a key part of the procedure.

**MOLECULAR ONCOLOGY LABORATORY**
Dr. D. Hogge

The purpose of the research in the Molecular Oncology Laboratory is to investigate the role of specific genes in controlling normal and malignant blood cell proliferation. Although much has been learned about the cell types from which mature blood cells arise, recent developments in molecular biology and recombinant DNA technology are allowing important new discoveries to be made about how these cells are regulated. The goal of the research in the Molecular Oncology Laboratory is to use the tools of molecular genetics and cell biology to further elucidate the role of growth factor glycoproteins, their genes and other related molecules in the etiology of hemopoietic malignancies.

**MOLECULAR GENETICS LABORATORY**
Dr. K. Humphries

Critical genetic programs ultimately determine the nature of normal blood cell production. Disruption of these leads to the aberrant growth seen in leukemia. Identifying key genes and their roles in these events constitutes the main goal of the Molecular Genetics Laboratory.

The work in this laboratory takes two complementary approaches. The first involves the use of specialized cloning strategies to purify genes that direct the production of molecules found on the surface of primitive blood-forming cells. Molecules of particular interest are those that permit the cell to respond to chemical signals and/or interact with neighboring cells.

The second line of investigation involves the use of gene transfer techniques to alter the genetic makeup of primitive bone marrow cells. One application of this is to genetically "tag" early blood cell precursors and hence follow their progeny and determine their growth ability and behaviour. Recent success with the transfer of marker genes into human marrow precursors indicates that we will soon be able to evaluate in bone marrow transplant patients, the role and need for specialized cell types contained in the bone marrow used to rescue them.

**MOLECULAR BIOLOGY LABORATORY**
Dr. Dixie Mager

Research conducted in this laboratory is involved in the elucidation of the genetic events that cause the development and progression of tumor cells. A main area of current research is the identification and study of novel multi-gene families. We have discovered one such family of genes that occurs naturally in the human genome at a copy number of 1000. These genes are structurally related to viruses such as the AIDS virus and can affect the expression of neighboring genes. Our analyses suggest that these genes may have the capacity to cause mutations by moving to different regions of the chromosomes or by inducing DNA rearrangements. Studies to evaluate the potential role of these "mobile" genes in different types of human cancers are underway.

**IMMUNOLOGY LABORATORY**
Dr. F. Takei

The research in this laboratory is concerned with two aspects of the immune system. First we are investigating the process of T-lymphocyte differentiation in the thymus. We are particularly interested in finding out what regulates the growth and differentiation of normal T cell precursors and in determining their differentiation potential. The involvement of lymphokines (growth factors that stimulate lymphocytes) as well as the cell-cell interactions that control these processes are also currently being studied.

Secondly, we are trying to characterize cell surface molecules involved in the activation of normal resting lymphocytes that are also expressed on malignant lymphocytes. A number of such molecules have been discovered using monoclonal antibody technology and cDNA cloning. The structures and functions of these molecules are now being studied in detail. Of particular interest is a new cell adhesion molecule which is thought to play an important role in reactions that may occur after bone marrow transplantation.

**TRANSPLANTATION BIOLOGY LABORATORY**
Dr. H. Klingemann

Research in this laboratory is focussed on selected issues in bone marrow transplantation biology. Major obstacles to successful bone marrow transplantation are the high incidence of infectious complications and relapse of the underlying disease. We are trying to learn more about the nature of the immunodeficiency that occurs in these situations and how we can interfere/improve it without aggravation of graft-versus-host disease.

Another project is concerned with identifying and characterizing the effect of fibronectin on the behaviour of certain types of blood cells, in particular under conditions where it can regulate cytokine gene expression and production.

A third project deals with the role of integrins (cell adhesion molecules) in the immune response. These molecules are involved in cell- cell and cell-target interactions. Ultimately we hope to use selected anti-integrin antibodies to interfere with graft-versus-host disease and prevent graft rejection after bone marrow transplantation.

# CANCER ENDOCRINOLOGY

**N. Bruchovsky, MD FRCPC, PhD**, Head
Honorary Professor (Medicine)

**C.T. Beer, FRIC DPhil(Oxford)**, Professor Emeritus (Biochemistry), Honorary Member, CCABC Professional Staff

**S.L. Goldenberg, MD FRCSC**

**P.W. Gout, PhD**, Honorary Associate Professor (Surgery)

**E.C. Jones, MD, FRCPC**

**R.L. Noble OC, MD, PhD DSc(London), FRSC**
Professor Emeritus (Physiology), Honorary Member, CCABC Professional Staff

**P.S. Rennie, PhD**, Honorary Professor (Surgery)

The function of this section is to evaluate the results of hormone therapy; to develop new ways of employing hormones, anti-hormones and other factors which regulate the endocrine glands; and to make recommendations concerning the future use of such agents for the management of cancers of the breast, prostate and endometrium. These malignancies present a major challenge to the resources of the Cancer Control Agency of British Columbia because of their high incidence and prevalence. Currently there are approximately 13,000 women with breast cancer and 7,500 men with prostate cancer in the province. In addition about 1,500 new cases of breast cancer and 1,600 of prostate cancer are diagnosed each year (1987 statistics); owing to demographic changes in the population the number of new cases is expected to increase by about fifty percent in the next decade. The majority of such patients will receive some form of endocrine therapy during their treatment history. Increasingly, sophisticated new technologies are being used to assess the potential danger of premalignant lesions and the risk of metastatic disease in early malignancy. The section has made a major commitment to the development of such procedures which, when implemented, will enhance the medical and economic benefits of future therapies. More emphasis will be placed on prevention of malignant progression and early intervention, therapeutic refinements which should help to check the rising prevalence rates.

The section is engaged in a number of basic and applied investigational projects which include the following studies: mechanism of action of testosterone; control of neoplastic growth by androgens and other hormones; cellular mechanisms of tumour progression focusing on autocrine growth factors; markers of androgen action in human prostate and their potential use in the clinical assessment of prostatic carcinoma; stromal-epithelial interactions in the pathogenesis of benign prostatic hyperplasia; relationship between androgen receptors and plasminogen activator in prostatic carcinoma; use of anti-androgens in the treatment of advanced prostatic carcinoma; use of 5 alpha-reductase inhibitors in the treatment of prostatic carcinoma; the study of the role of hormones of the anterior pituitary in the growth of malignant lymphomas; an investigation of the biological and biochemical changes occurring in malignant lymphomas as they progress from hormonal dependency to autonomy; and the evaluation of risk of malignancy using flow cytometer and oncogene screening.

*Certain cancers which initially depend on hormones for growth can develop into hormone-insensitive malignancies and as a result become unresponsive to anti-hormonal therapy. Dr. Peter W. Gout studies the biological and biochemical mechanisms which underlie this "malignant progression."*

Currently the section is devoting much of its effort to completing the groundwork for the establishment of an Oncogene Diagnosis Service focusing on the application of flow cytometry and oncogene screening to the assessment of carcinomas of the prostate, breast and cervix. There is considerable evidence linking the inappropriate activation of certain normal human genes, termed proto-oncogenes, to the development and spread of cancer. In particular a strong correlation between the aberrant formation of multiple copies of specific oncogenes (gene amplification) and poor prognosis (ie, a shorter time to relapse and a lower survival rate) has been well documented in neuroblastomas, small cell lung carcinoma and breast carcinoma. The screening of these cancer-related genes will initially involve measurement of the N-myc oncogene in neuroblastomas, the c-myc oncogene in small cell lung carcinoma and the HER-2/neu oncogene in breast carcinoma. In addition, it is anticipated that the Oncogene Diagnosis Service will provide an environment that will facilitate the immediate implementation of new prognostic tests in this rapidly developing area. One such breakthrough with major clinical ramifications is the discovery of a gene that confers multiple drug resistance upon a cancer cell. Since the expression of this gene in a breast cancer would signify that the tumour will not respond to cytotoxic drugs, the selection of candidates for adjuvant chemotherapy could be done with greater precision while alternative treatments affording a better outlook could be offered much sooner to women with drug-resistant cancer.

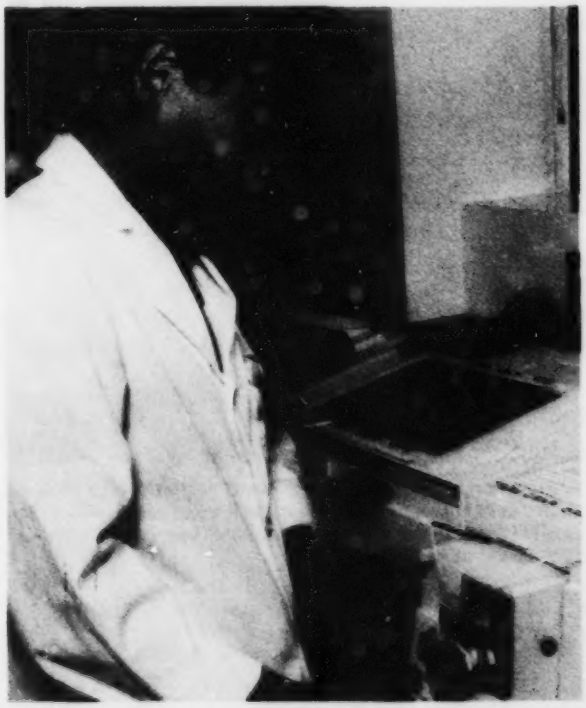
The section continues to devote much of its effort to the development, testing and application of new drugs which have clinical potential in the treatment of prostate carcinoma. As long as the cancer remains confined to the prostate it is curable by surgery but in fifty to sixty percent of cases it has already spread outside the gland at the time of diagnosis and more complex therapy is necessary to control it and lengthen survival. Investigations conducted by the section have shown that the effectiveness of the anti-androgen, cyproterone acetate, is enhanced by the co-administration of a small dose of diethylstilbestrol (synthetic female sex hormone) which acts synergistically with cyproterone acetate to suppress the pituitary gland. In clinical testing the combined therapy produced an objective response rate of ninety-eight percent with survival of eighty percent of patients after one year and fifty percent after two years. Such treatment offers the advantage of a prompt onset of action with a high probability of gaining benefit in terms of symptomatic improvement. The treatment has also been shown to be one of the most cost-effective in the treatment of prostate cancer. In the first Canadian trial of a new long-acting LHRH agonist, ICI 118630, the section is determining if the incidence of side-effects associated with the use of cyproterone acetate and low-dose diethylstilbestrol can be reduced by substituting 1C1 118630 for diethylstilbestrol in the long-term treatment of advanced prostate cancer with multiple hormonal agents. This assumption appears to be correct since virtually no side-effects associated with the use of diethylstilbestrol have been observed in the patients entered into the trial.

Even though all prostate cancer cells should be killed by such treatment, it is inevitable that some of them survive and grow back to give rise to life-threatening complications. Fortunately, it is becoming increasingly clear why a few cancer cells manage to survive powerful anti-hormone therapy. This is due to the fact that prostate cells may contain a small sub-population of specialized cells, some of which are protected against changes in the hormonal environment. The section has been successful in developing a model system which measures the number of such cells, affording for the first time an opportunity to study the impact of various types of therapy on the lethal component of the tumour.

Operating grants in support of the basic and applied investigations have been received by Drs. N. Bruchovsky, C. Beer, P. Gout and P. Rennie from the Medical Research Council of Canada and the National Cancer Institute of Canada. The year was highlighted by an event of special significance. Dr. Noble became an officer of the Order of Canada in recognition of his discovery of a new class of anti-cancer agents, the vinca alkaloids, and of his outstanding contributions to the field of cancer endocrinology.

Visitors to the section included: Professor Dr. Keith Griffiths, Tenovus Institute for Cancer Research, Cardiff, United Kingdom; Dr. Douglass Tormey, University of Wisconsin, Madison, Wisconsin; Dr. Barry Furr, ICI Pharmaceuticals, Cheshire, United Kingdom; and Dr. Michael Wilson, Veterans Administration Hospital, University of Minneapolis, Minneapolis, Minnesota.

The section has frequently drawn on support for its activities from the University of British Columbia, Departments of Medicine, Urology and Pathology, each of which has given generously of time and patient resources throughout the year.



*Hormonal effects on prostatic tissue are regulated by the androgen receptor. Antibodies were raised to various domains of the androgen receptor to study androgen receptor processing and expression. These antibodies can also be tested as diagnostic tools in prostatic cancer.*

# ADVANCED THERAPEUTICS

**H.K.B. Silver, BSc, MD, PhD, FRCPC, FACP,** Head
Clinical Professor
(Medicine)

**J.H. Goldie, MD, FRCPC**
Clinical Professor
(Medicine)

**F.A. Salinas, BSc, DVM**
Clinical Professor
(Pathology)

**S.R. Dedhar, BSc, MSc, PhD,** Assistant Professor
(Pathology)

**R.J. Klasa, MDCM, FRCPC**
Assistant Clinical Professor
(Medicine)

The section of Advanced Therapeutics is continuing its pursuit of basic research with direct relevance to patient management. General areas of special interest include the in-depth evaluation of biological agents, analysis of tumour cell resistance to chemotherapy, development of new techniques of clinical monitoring and investigation of basic mechanisms of tumour cell growth and metastasis.

In our work on the new biological agent interleukin-2 (IL-2) we wished to see if we could identify a delivery system that would allow activation of immune cells while reducing the severe toxicity observed by others. Dr. R. Klasa's studies have shown that this can be achieved by delivering IL-2 to immune cells in the spleen via the splenic artery. Development of second generation studies is now in progress to enhance our early results. In related work we are also evaluating the IL-2 therapy when delivered in small vesicles called liposomes. Preliminary results indicate this technique also delivers IL-2 preferentially to immune cells.

Dr. J.H. Goldie has also initiated a liposome program, in this case looking at the therapeutic advantage of encapsulated delivery of chemotherapeutic agents.

Studies on tumour cell resistance are continuing as part of a collaborative effort to identify novel folic acid antagonists. As part of a separate project, the role of artificial intelligence computing techniques is being examined in relation to the detailed clinical CCABC database on Hodgkin's disease.

*Spencer Kong of Dr. Silver's lab is adding an interleukin-2 treated patient's lymphocytes to tumor "target" cells to measure tumor killing abilities of natural killer cells and lymphokine activated killer cells in these patients. Our study shows that interleukin-2 elevates the killing abilities of both types of killer cells in these patients.*

Our efforts to improve diagnosis and monitoring should lead to more specific strategies for the serious skin cancer, malignant melanoma. Dr. H.K.B. Silver and his group have used advanced flow cytometric techniques to help identify high risk patients who may benefit from more aggressive treatment. In these studies the DNA content of tumour cells was found to be an independent predictor for recurrence and survival. This, in association with another predictor earlier identified by them, allows much greater predictive power than previously available. In the Tumour Marker Laboratory a sophisticated computerized data management system is being developed to deal with the volume of data and allow improved analysis of serial values from individual patients.

This centralized facility is a unique resource for British Columbia patients. We are continuing to look at new tumour markers, such as a variety of potential markers for breast cancer, and the use of nuclear magnetic resonance (NMR) to identify cancer associated lipids. Dr. F.A. Salinas is also evaluating the potential of immune complexes and related reactants for tumour monitoring.

Dr. S.R. Dedhar has identified fibronectin-related polypeptides that not only control tumour cell adhesion but also appear to be important in regulating cell behaviour including the ability of cancer cells to spread. Similar substances appear to be important in the control of immune function. These findings will be closely evaluated to see how they might be applied to improving patient treatment.

*Kathy Robertson from Dr. Dedhar's lab is reading the nucleotide sequence of one of the integrin genes. Integrins are a family of cell-matrix adhesion receptors that are important for the interaction of tumor cells with extracellular matrices during metastasis.*

# EPIDEMIOLOGY, BIOMETRY AND OCCUPATIONAL ONCOLOGY

**P.R. Band, BA, MD, FRCPC,** Head, Honorary Professor (Medicine), Clinical Professor (Health Care & Epi)

**T.G. Hislop, BSc, MSc, MD, CM**, Clinical Assistant Professor (Health Care & Epi)

**A.J. Coldman, BSc, MA, PhD,** Diploma in Epi. Adjunct Professor (Statistics)

**R.P. Gallagher, BSc, MA,** Clinical Assistant Professor (Health Care & Epi), Associate Member (Ophthalmology)

**J.J. Spinelli, BSc, MSc,** Honorary Lecturer (Health Care & Epi)

**M.L. McBride, BA, MSc,** Honorary Lecturer (Health Care & Epi)

**W.J. Threlfall, BSc, MSc**

**V.T.Y. Ng,** M.Math

The research activities of our division which consists of three sections have been supported by grants amounting to $600,000 from the following sources: National Health Research Development Program, Workers' Compensation Board of B.C., B.C. Health Care Research Foundation, National Institutes of Health and B.C. Cancer Foundation.

In 1988-89, members of the division published 20 papers/book chapters.

## OCCUPATIONAL ONCOLOGY SECTION

The occupational oncology program has been designed to identify, using a stepwise methodic approach, cancer risk factors and occupational carcinogens in the workplace. Two broad-based, hypothesis-generating studies have been completed and published by Statistics Canada: "Occupational Mortality in British Columbia 1950-78" and "Atlas of Cancer Mortality in British Columbia 1956-83".

Our major on-going study involves the collection, by means of self-administered questionnaire, of life-time work history and smoking information on every male cancer patient aged 20 years and over ascertained by the British Columbia Cancer Registry. To date 14,000 questionnaires have been completed and this large data base is currently being analyzed. A preliminary report of the findings was presented at the International Symposium on Occupational Cancer Epidemiology organized by our division.

The establishment of a job-exposure matrix for the main industries of B.C. carried out with the Department of Chemical Engineering at UBC is progressing and should be completed within the next three years. A study of Canadian Airlines International pilots is under way.

## EPIDEMIOLOGY SECTION

The Section of Epidemiology has studies under way in a number of areas of research.

An ongoing program investigating the etiology of breast cancer as well as benign breast disease is yielding important scientific results. Male and female reproductive organs are the subject of another series of etiologic studies conducted in collaboration with the Fred Hutchinson Cancer Center in Seattle.

Our section recently conducted a study of benign nevi in six Vancouver schools. Data was collected on skin and hair colour, propensity to burn in the sun, suntan and sunburn history, and recreational sunlight exposures. The data is being analyzed at present and a great deal of useful information is expected.

Data sets on five well-conducted case-control studies of malignant melanoma have been obtained. Data gathered in these studies from areas of high, medium and low sunlight exposure comprises information collected using similar questionnaires. A pooled analysis of the data will be conducted and will enable us to conduct anatomic site-specific analyses of the effect of certain risk factors.

Our section is also involved in etiologic aspects of childhood and developmental cancers with studies on testicular cancer and cryptorchidism. A major study on the etiology of childhood leukemias with emphasis on low frequency electromagnetic field as a risk factor is in the final phase of development. This will be a Canada-wide study with our division acting as the coordinating centre.

Other projects include a case-control study of colorectal cancer among North American Chinese of B.C., San Francisco and Los Angeles and a collaborative Canadian study of thyroid cancer.

## BIOMETRY SECTION

The Biometry Section provides statistical support to a wide range of projects.

One area receiving attention is the development and use of record linkage algorithms for the analysis of cohort and cross-sectional surveys. These techniques are of particular importance in the analysis of occupational cohort studies and are currently in use in a project designed to calculate the survival experience of cancer patients in British Columbia.

Members of the section investigate determinants of the success of cancer chemotherapy. Research is currently under way into the notion of dose intensity and in determining how it may be integrated with other known factors influencing tumour response. There is active research into a number of projects involving the application of computers in medicine. One of these is an interface for the processing of data which could be used by clinicians.

All members of the section offer statistical and computing support to researchers in other divisions. The nature of such work is diverse and frequently provides areas for further theoretical research. One such example is the analysis of quality of life data in clinical trials.

# JOINT ANIMAL FACILITY

The Joint Animal Facility is supported financially by the British Columbia Cancer Foundation, the Cancer Control Agency of British Columbia and the University of British Columbia. The services provided by the Facility include the housing, care, breeding and ordering of experimental animals (rodents) and the provision of space for experimental work involving animals. The guidelines of the Canadian Council on Animal Care are closely followed.

Following an on-site inspection of the Facility, the Canadian Council on Animal Care turned in a very favorable report. A recommended rebalancing of the air supply and exhaust system has led to a significant improvement in the overall quality of the air of the Facility. Recently, two down-flow sterile animal housing cabinets have been acquired for research involving immuno-deficient rodents.

Special thanks are due to Mr. Fred V. Jensen, the Senior Technician in the Facility, who has maintained the high quality of animal care throughout the seven years of operation. He has been well supported by Mrs. Sandy Mills and by Mrs. Charlene Vikse, who has recently replaced Sandy.

The members of the Joint Animal Facility Management Committee (which oversees the operation of the Animal Facility) were Drs. D.J. Chaplin, A. Eisen, P.W. Gout, J. Love, F.A. Salinas and J. Vielkind.

**Dr. P.W. Gout,** Chairman

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British
Columbia
Cancer
Foundation

# British Columbia Cancer Foundation

The British Columbia Cancer Foundation is a society incorporated under the "Societies Act" of British Columbia and is registered as a charitable organization under the provisions of the "Income Tax Act" of Canada.

The Foundation which owns and operates the British Columbia Cancer Research Centre, as at August, 1984, also became the Foundation for the Cancer Control Agency of British Columbia, which operates cancer clinics throughout British Columbia. As such, the British Columbia Cancer Foundation is responsible for raising the supplementary funding needed by the Cancer Control Agency for items such as capital equipment not covered by provincial government grants.

The Foundation is totally dependent upon the generosity of the citizens of British Columbia to meet its cancer research and treatment commitments. You can support the work of the British Columbia Cancer Foundation by making a private or 'in memoriam' donation or by making the Foundation a beneficiary in your will. Donations are deductible for income tax purposes and may be made directly to:

British Columbia Cancer Foundation
601 West 10th Avenue
Vancouver, B.C.
V5Z 1L3
Tel: 877-6010
The Foundation accepts both *MasterCard* and *VISA*.

All donations to the B.C. Cancer Foundation remain in B.C. to be used in the development of research, diagnosis and treatment which will be of direct benefit to cancer patients in the province.

A receipt will be issued, including the prescribed information, for purposes of the "Income Tax Act".

The British Columbia Cancer Foundation is most grateful to those whose generosity helps in the ongoing fight against cancer.

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Lieutenant-Governor of British Columbia

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# President's Report

1988-89 proved to be the most successful financial year which the Foundation has enjoyed in recent years. This was principally due to more than a million dollars in bequests which came to us from generous people who wished to show either their appreciation for the care and treatment which they had received at the Clinics operated by the Cancer Control Agency of British Columbia (CCABC), or who wished to participate as part of the team in the cause of cancer research at the British Columbia Cancer Research Centre. Other factors which contributed to our successful year were an increase in "in memoriam" gifts and expansion of our fund raising activities. This was most gratifying after back to back deficits for years.

As your Honorary Treasurer has reported we are unable to carry this good news into the 1989-90 year. Our forecast for bequest funding is considerably below the preceding year, our fund raising activities have not yet reached the level where they can substitute for such funding and the Canadian Cancer Society has determined not to support our research operations, within this funding year.

We have now completed our first full year where we have utilized the CCABC's services for administration, financial information, and plant management. In this regard we thank Dr. David Klaassen, Director of the CCABC, Mr. Brian Schmidt, Deputy Director, Mr. Don Morrison, Director of Finance, and Mr. Stanley Young, Director of Plant Operations, for their outstanding support and cooperation.

We were pleased that Mr. Richard Whittall, a senior member of the Canadian investment community, agreed to chair our Investment Advisory Committee. As funds under our administration for cancer treatment and research and patient care continue to grow and as we are attempting to secure the future of the Research Centre and the special funding needs of the CCABC through increased contributions to our endowment funds, Mr. Whittall's committee will be most relevant.

During 1988-89, we were also fortunate to recruit a volunteer advertising agency. The well-known and highly respected national firm of Kenmuir Cossette (now known as Cossette) agreed to handle promotional programs for the Foundation and the CCABC, foregoing their normal fee-for-service. They have already completed their first advertising campaign on the cancer cause which we hope to see in the media in the Fall/Winter of 89-90. Our thanks to Cossette for their important contribution.

On the fund raising front, the B.C. Cancer Foundation is facing immense competition from a myriad of non-profit agency and hospital campaigns for the charity dollar. In the past year, for the first time, the Agency Executive approved an ongoing fund raising campaign which is projected to provide the revenue to support the work of our scientists at the Research Centre and to provide funding for the CCABC's equipment and other needs which are not covered under the Ministry of Health's Hospital Programs. For the first time we participated in casinos and bingos which are operated under the jurisdiction of the B.C. Gaming Commission. We conducted our first Annual Christmas fund raising campaign directed at Friends of the Foundation and patients of the Clinic who were identified as either being cured or in remission. I have already spoken of the increases we have enjoyed in our bequest revenue and "in memoriam" gifts and these are areas where we will be intensifying our activities.

Of major importance to the cancer cause in B.C., and specifically to the CCABC, is the Agency's first ever Capital Fund Campaign, being conducted by the Foundation on behalf of the CCABC. To develop and direct the campaign, the Foundation appointed the firm of fund raising consultants, Community Charitable Counselling Services. This company has one of the best records in North America as hospital fund raisers. The first six months of the Campaign were dedicated to the organization phase. Now, with a Steering Committee in place, the Campaign will move into active solicitation.

The theme of the campaign is "Pursuing a New Level of Excellence", and its purpose is to provide, for the CCABC and the Research Centre, equipment and facilities which will help to continue to maintain in the future the same high level of diagnosis and treatment for which it has become world famous, in the face of a rising incidence of cancer patients in the province.

The rapid changes which are taking place in cancer research and treatment necessitated the introduction of peer reviews of the various scientific units in the B.C. Cancer Research Centre. The past year saw us initiate the first such review. We wish to thank senior scientists from other parts of Canada and the United States who participated in the review of the Environmental Carcinogenesis Unit. Similar reviews will be undertaken of other units over the next several years.

It is now generally recognized that our scientists at the Research Centre are well known and acclaimed by scientists at other centres and the medical profession throughout the world. There can be no better recognition of their work than the continuing support which they received in the past year from such prestigious organizations as the National Cancer Institute (Can), the National Cancer Institute (US), The Medical Research Council of Canada, The British Columbia Health Care Research Foundation, The United States National Institutes of Health, the Vancouver Foundation, the P.A. Woodward Foundation and the University of British Columbia. We also thank the Canadian Cancer Society, B.C. & Yukon Division, for their contribution to the operating funds of the B.C. Cancer Research Centre.

I acknowledge the continuing and outstanding support provided by several women's organizations: the Women's Auxiliary to the CCABC and the Foundation, the Order of the Eastern Star, the IODE, and the Women's Auxiliary to the Fraternal Order of Eagles.

I also thank the members of the Board of Directors and the Executive Committee and our Executive Director, David Catton, our secretary Brenda Prieur and the rest of the staff for their assistance and cooperation and the support of a number of active Standing Committees of the Board.

It is gratifying to report that we made excellent progress on several of the Foundation's initiatives in 1988-89 and while we anticipate that the 1989-90 year will call for us to make some difficult financial decisions, the long term future looks promising because we now have in place programs which will address many of those long term problems which have been responsible for past difficulties.

**Ian M. Adam**
President

## Women's Auxiliary

The Women's Auxiliary to the B.C. Cancer Foundation, the Canadian Cancer Society (B.C. and Yukon Division) and the A. Maxwell Evans Clinic is now in its forty-third year of service. We are not a fund-raising organization and we are grateful for the financial support given us by the Society and the Foundation. Most of our funds are used to provide various patient comforts.

We purchase material to make headscarves for chemotherapy patients, stoma bibs for tracheotomy patients and special binders for patients leaving the operating room.

At Christmas we distribute baskets filled with home baking, fruit and knitted goods to hospital patients and those staying at the Lodge. Food vouchers are given to certain patients on the advice of the Social Work Department. Although most of our magazines are donated, we subscribe to a few so that we can keep waiting rooms and examining rooms supplied with current reading material.

During the year our members give their services to a variety of activities. The Escorts meet and accompany new patients to various departments, the Aides assist in the Ambulatory Care clinics, the Cart ladies make the rounds with the "candy wagon", the Patient Aides serve coffee and juice in the Radiotherapy Department, two ladies keep magazines circulated and updated and our sewing ladies are kept busy by the increasing demand for headscarves and stoma bibs.

Volunteers also continue to provide patient support at the TRIUMF treatment centre. In addition to these services, our volunteers respond to requests from the Social Work Department to accompany out-of-town patients to the airport and we are assisting with one of the Foundation's fund-raising projects.

During the Christmas season, we have the pleasure of decorating the Clinic and distributing poinsettias to various departments. At our annual meeting in April 1988, Mrs. Rogers, our Honourary Patroness, presented four of our members with long service pins, one for 20 years of service, two for 25 years and for the first time a 30-year pin was presented.

As a representative of the Auxiliary, it has been my privilege to serve on the Board of Directors of the Cancer Society and the Foundation and to attend as an observer the meetings of the Board of Directors of the Cancer Control Agency. This has given me insight into the problems and goals of these organizations. On behalf of the Women's Auxiliary, I would like to thank the Foundation and the Cancer Control Agency for their continued interest and support.

**Luisa Thompson**
President, Women's Auxiliary.

## Student Research Awards

*Gerald James*

### A. Maxwell Evans Award

Gerald James was born in Winnipeg, Manitoba on May 12, 1966. There, he lived with his family until September, 1979 when they moved to Lions Bay, BC. Gerry attended West Vancouver Secondary School until graduation in June, 1984. His interest in the Sciences prompted him to enter the Faculty of Science at U.B.C. He is presently in the Faculty of Medicine (first year), and is welcoming the opportunity to work at the Cancer Control Agency of B.C. this summer.

# Report of the Finance Committee

After three years of deficit financial activity, the Foundation has finally wound up the 1988-89 year in a surplus position, with projected income meeting the requirement of budgeted expenses for the first time in several years. It must be noted, however, that this surplus has to be attributed to an unexpectedly high level of donated funds from both bequests and in memoriam gifts. Our forecasts do not predict an equivalent donations windfall for the coming year.

Accordingly, the budget process for the 1989-90 fiscal year considers a donations income level considerably below that of last year. Of much greater concern is a major shortfall of, heretofore, annual financial support which has been denied the Foundation for our next year. It will be extremely difficult to deal with this shortfall. However, there is a fundraising program underway which will address this problem and assist the Foundation to fulfill its mandate to meet the ever-increasing needs of the various phases of cancer research and treatment. It should be pointed out too that our physical plant is in dire need of costly repair. At this stage and in view of the foregoing considerations, we cannot be certain that sufficient funds will be raised to offset a projected deficit of $357,000. However, an unrelenting effort to do so will continue.

On behalf of Finance Committee members, Messrs. V.F. MacLean, I.M. Adam, and Mrs. Anna Linsley, I wish to say thanks for the helpful support of Ms. Brenda Prieur, Ms. Sharon Kennedy, Messrs. D.S. Catton, D. Morrison and our auditors, Price Waterhouse.

Fred Moore
Chairman
Finance Committee

# Bursary, Scholarship and Awards Committee

The Bursary, Scholarship & Awards Committee met in February to review a total of 16 studentship applications for the May - August term. As in the past, awards were granted on the basis of each student's qualifications as well as the quality and relevance of the proposed project in the field of oncology.

I am pleased to report that a total of 12 studentship awards were granted, including the J.M. Warren and A. Maxwell Evans Awards. An additional studentship was later awarded as the Foundation received a grant from the Challenge '89 program.

The studentship recipients for 1989 are: Sanjay Parikh, Mark McLaughlin, Patrick Zaidel, Kenneth Wong, Gerardo Carpenito, Michael Grigg, Vivienne Jones, Torsten Nielsen, Megan Sterling, Jeremy Jackson and Karim Mawji.

Every year, the A. Maxwell Evans and the J.M. Warren Awards are granted to two outstanding students. This year, Mr. Gerald James was awarded the A. Maxwell Evans Award, on the advice of the Faculty of Medicine, University of British Columbia. Mr. James is working with Dr. I. Olivotto of the Cancer Control Agency of British Columbia to evaluate the effectiveness of radiation in the treatment of breast cancer.

The J.M. Warren award was granted to Miss Leslie-Jean MacMillan, the highest ranking studentship applicant. Miss MacMillan is working with Dr. J.P. Van Netten in Victoria on a project aimed at demonstrating if a tumour's growth direction can be determined.

*Leslie-Jean Macmillan*

The students will be working under the supervision of senior scientists who are affiliated with the B.C. Cancer Research Centre, the University of British Columbia and the University of Victoria.

In the past, funding for these awards has been provided equally by the B.C. Cancer Foundation and the Canadian Cancer Society. This year, however, the Canadian Cancer Society has provided total funding for the studentships. We are grateful to the Society for their support and generous contribution to this important program.

During 1988-89, the British Columbia Cancer Foundation approved 16 travel grants to graduate students and post-doctoral fellows. These grants were established to help defray travel costs when students are invited to attend conferences to present their work in the field of cancer research.

Both the studentship program and the travel grants are important to the British Columbia Cancer Research Centre. These prestigious awards enable us to recognize academic excellence and to encourage promising young people to pursue a career in oncology.

The Committee, last year, established new procedures to streamline the processing of applications and to bring the Foundation's timetable in line with that of the universities. The members found that this system worked very well and the award process will follow these guidelines in future.

I would like to thank the members of the Committee for their guidance and assistance in making this educational program a success: Dr. N. Auersperg, Dr. G. Ballantyne, Dr. D. Mager, Dr. B. Palcic, Mrs. A. Pattie, Dr. P. Rennie, Dr. H. Stich, Mr. I.M. Adam, and Mr. D. Catton.

Anna Linsley
Chairman

# Financial Statements

## Auditors' Report
May 19, 1989

To the Board of Directors,
British Columbia Cancer Foundation:

We have examined the balance sheets of the general and designated funds and the British Columbia Cancer Research Centre fund of the British Columbia Cancer Foundation as at March 31, 1989 and the statement of changes in the general and designated fund balances for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion these financial statements present fairly the financial position of the Foundation as at March 31, 1989 and the results of its operations for the year then ended in accordance with accounting principles described in Note 2, on a basis consistent with that of the preceding year.

*Price Waterhouse*
*Chartered Accountants*

# Financial Statements

## Balance Sheet
## General and Designated Funds

| | March 31 1989 | 1988* |
|---|---|---|
| **ASSETS** | | |
| Current assets: | | |
| Cash (Note 3) | $ 1,348,432 | $ 192,186 |
| Investments, at cost which approximates market | 1,821,836 | 62,698 |
| Amounts receivable (Note 4) | 214,913 | 366,787 |
| Prepaid expenses | 144,382 | 7,941 |
| Inventory | 65,615 | 65,615 |
| | 3,595,178 | 695,227 |
| Other investments, at cost (market value$1,572,626; 1988 - $1,797,017) | 1,722,156 | 1,722,156 |
| British Columbia Cancer Foundation Endowment Fund (Note 5) | 734,000 | 729,000 |
| | $ 6,051,334 | $ 3,146,383 |
| **LIABILITIES AND FUND BALANCES** | | |
| Current liabilities: | | |
| Due to Cancer Control Agency of British Columbia | $ 279,019 | $ 490,514 |
| Accounts payable and accrued liabilities | 91,348 | 95,945 |
| Deferred revenue | 51,410 | — |
| | 421,777 | 586,459 |
| Fund balances: | | |
| General | 1,022,840 | 631,290 |
| Designated | 4,606,717 | 1,928,634 |
| | 5,629,557 | 2,559,924 |
| | $ 6,051,334 | $ 3,146,383 |

APPROVED BY THE BOARD:

Director

Director

*Restated (Note 9)*

## Balance Sheet
## British Columbia Cancer Research Centre Fund

| | March 31 1989 | 1988 |
|---|---|---|
| **ASSETS** | | |
| Land, buildings and improvements, at cost (Note 6) | $ 4,190,552 | 4,155,688 |
| **FUND BALANCE** | | |
| Fund balance | $ 4,190,552 | $ 4,155,688 |

# Statement of Changes in General and Designated Fund Balances

| | Year ended March 31, 1989 | | | Year ended March 31, 1988 | | |
|---|---|---|---|---|---|---|
| | General Fund | Designated Fund | Total | General Fund | Designated Fund | Total |
| Fund balances at beginning of year | $631,290 | $1,928,634 | $2,559,924 | $1,195,907 | $1,962,753 | $3,158,660 |
| Additions: | | | | | | |
| Revenue- | | | | | | |
| Bequests | 1,021,223 | 2,781,680 | 3,802,903 | 754,798 | 105,583 | 860,381 |
| Donations | 300,330 | 229,072 | 529,402 | 284,154 | 198,864 | 483,018 |
| Investment income | 247,338 | 179,950 | 427,288 | 260,100 | 116,356 | 376,456 |
| Fees from services | 388,172 | — | 388,172 | 156,727 | — | 156,727 |
| Canadian Cancer Society - Conquer Cancer Campaign | 144,000 | — | 144,000 | 100,000 | — | 100,000 |
| Studentships | 20,000 | — | 20,000 | 27,412 | — | 27,412 |
| Fund Raising Projects - net of direct expenses | 173,349 | — | 173,349 | 77,854 | — | 77,854 |
| Other | 40,659 | 115,619 | 156,278 | 140,512 | (40,187) | 100,325 |
| | 2,335,071 | 3,306,321 | 5,641,392 | 1,801,557 | 380,616 | 2,182,173 |
| Deductions: | | | | | | |
| Research expense- | | | | | | |
| Core Support Units- | | | | | | |
| Cancer Imaging Unit | 194,890 | — | 194,890 | 176,220 | — | 176,220 |
| Environmental Carcinogenesis Unit | 156,058 | — | 156,058 | 177,274 | — | 177,274 |
| Medical Biophysics Unit | 389,002 | — | 389,002 | 457,949 | — | 457,949 |
| B.C. Cancer Research Centre - net of recoveries | 548,359 | — | 548,359 | 600,699 | — | 600,699 |
| Laboratory and other services | 384,109 | — | 384,109 | 450,568 | — | 450,568 |
| Cancer Control Agency of B.C. support | 5,604 | 517,646 | 523,250 | 199,147 | 314,049 | 513,196 |
| Designated projects | — | 110,592 | 110,592 | — | 197,478 | 197,478 |
| Unallocated administration (Note 7) | 192,671 | — | 192,671 | 262,624 | — | 262,624 |
| Other | 72,828 | — | 72,828 | 41,693 | (96,792) | (55,099) |
| | 1,943,521 | 628,238 | 2,571,759 | 2,366,174 | 414,735 | 2,780,909 |
| Change in fund balances | 391,550 | 2,678,083 | 3,069,633 | (564,617) | (34,119) | (598,736) |
| Fund balances at end of year | $1,022,840 | $4,606,717 | $5,629,557 | $631,290 | $1,928,634 | $2,559,924 |

# Notes to Financial Statements
March 31, 1989

1. **Nature of operations:**

The Foundation funds and operates the British Columbia Cancer Research Centre facility (the Research Centre). The Foundation allocates its revenues as follows-

Operating funds-

(a) General Fund-

This fund receives all revenues which are not specified or designated at source as to their use. The Executive of the Foundation from time-to-time commits certain of these revenues to specific projects of the British Columbia Cancer Research Centre Fund and the Cancer Control Agency of British Columbia.

(b) Designated Fund-

This fund includes bequests, donations and investment income which are designated for a specific use by the donor.

British Columbia Cancer Research Centre Fund-

This fund represents the cost of the Foundation's investment in the land, buildings and improvements of the Research Centre.

2. **Accounting policies:**

The Foundation's accounting policies follow generally accepted accounting principles except that-

(a) Income from bequests and donations is recorded when received.

(b) Land, buildings, and improvements held for research purposes are capitalized in the British Columbia Cancer Research Centre Fund at cost and no depreciation is charged.

3. **Cash:**

The Foundation has invested $1,105,000 in an interest bearing account administered by The Cancer Control Agency of British Columbia.

4. **Amounts receivable:**

The Foundation administers investigative grants awarded by various private and public institutions to scientists for specific research projects undertaken at the Research Centre. These grants are accounted for on a net basis to the extent that the Foundation has made advances on behalf of the funding institutions, reflecting the custodial nature of the Foundation's role. These amounts are included in amounts receivable in the general and designated funds balance sheet-

| | 1989 | 1988 |
|---|---|---|
| Advances at beginning of year | $ 208,099 | $ 191,398 |
| Expenditures | 1,345,592 | 1,092,129 |
| | 1,553,691 | 1,283,527 |
| Receipts | 1,471,175 | 1,075,428 |
| Advances at end of year | $ 82,516 | $ 208,099 |

5. **British Columbia Cancer Foundation Endowment Fund (the Fund):**

The Fund is administered by the Vancouver Foundation with the British Columbia Cancer Foundation receiving the income generated from the Fund after deduction of administrative costs. Under the terms of the agreement, the British Columbia Cancer Foundation will be entitled to withdraw all of its contributions to the Fund after 1990 with the exception of $10,000 initially contributed and expensed by the British Columbia Cancer Foundation in 1981. The capital in the Fund amounted to $1,159,000 at March 31, 1989 (1988 - $1,154,000) of which $744,000 was contributed by the British Columbia Cancer Foundation and $415,000 by the Vancouver Foundation.

6. **Fixed assets:**

During the year $34,864 (1988 - $164,972) of fixed assets were capitalized, of which $9,984 was reimbursed by the Cancer Control Agency of British Columbia. The Foundation's portion ($24,880) has been expensed in the General Fund.

7. **Unallocated administration expense:**

| | 1989 | 1988 |
|---|---|---|
| Salaries | $ 32,655 | $ 105,558 |
| Office and general | 60,945 | 43,178 |
| Legal and audit fees | 21,082 | 40,387 |
| Funding and development | 77,989 | 73,501 |
| | $192,671 | $ 262,624 |

8. **Statement of changes in financial position:**

A statement of changes in financial position has not been presented as it is not considered meaningful in the circumstances.

9. **Restatement of comparative amounts:**

The Foundation has reclassified certain investments as non-current assets recognizing its policy to now hold these securities for the long-term.

# Donations and Bequests

## received during the period April 1, 1988 to March 31, 1989

*The following donations and bequests are acknowledged with thanks:*

**INDIVIDUALS**

Abakhan, Mr. & Mrs. George ..... $100
Adam, Mr. Ian ..... 400
Adams, Mr. David ..... 100
Adamson, Donald C. ..... 200
Albinson, J.C. & K.J. ..... 100
Algard, Annette E. ..... 100
Allen, Mrs. Mary ..... 100
Allen, Ms. Irene ..... 100
Allison, Ms. Gwen ..... 125
Anderson, Catherine ..... 150
Andjelic, David ..... 100
Ankenman, Dr. G. John ..... 100
Anonymous ..... 2,000
Anonymous ..... 5,000
Anonymous ..... 2,000
Anonymous ..... 100
Archer, Ms. Betty ..... 150
Archibald, Jean Ross ..... 100
Austin, Richard ..... 625
Averill, Mr. Robert ..... 300
Bailey, Mr. Brion ..... 100
Balsor, Mrs. Alice ..... 100
Barber, Ronald F. ..... 200
Barnes, Ms. Audrey ..... 2,000
Barr, Mr. & Mrs. L.M. ..... 300
Battista, Judy ..... 100
Bayford, Mrs. Dawn ..... 100
Belancic, Roberta ..... 200
Belkin, Helen ..... 100
Bell, Lyall O. ..... 100
Bell, Elizabeth S.A. ..... 550
Bennett, Clifford W. ..... 225
Bennett, Mr. & Mrs. W.W. ..... 100
Bentley, Antoinette R. ..... 200
Bentley, Peter J.G. ..... 1,000
Berger, Beverly & Tom ..... 100
Bessner, Leonard ..... 5,000
Bhangu, Hari ..... 100
Birnie-Danzker, Jo-Anne ..... 200
Black, Mr. William ..... 100
Black, Ms. Georgia ..... 100
Blackwood, Mr. A. ..... 100
Blaxland, Robyn ..... 400
Blom, Mr. J. ..... 1,000
Bonner, Ms. Shirley ..... 200
Bose, D. Julie ..... 100
Boultbee, J.L. ..... 100
Bowie, Iain ..... 100
Braaton, Mr. Alvin ..... 100
Brazier, C.W. ..... 600
Brazier, Mr. & Mrs. George ..... 100
Bree, J.H. ..... 800
Brent, Allan & Myra ..... 100
Brett, G.A. ..... 200
Brewerton, Iris G. ..... 100
Brinton, Mr. Eric ..... 100
Brockhouse, Dr. B.N. ..... 2,550
Brockhouse, Mr. Gordon ..... 7,500
Brody, Mr. H.S. ..... 600
Broughton, Miss Sandra ..... 1,500
Brown, Mrs. Dorothy ..... 300
Brown, Mrs. Wilma ..... 100
Browne, Mr. G.R. ..... 500
Bruce, Mr. David ..... 100
Bruk, John ..... 2,862
Bruk, Mr. John ..... 500
Burley, Mrs. A. ..... 200
Burrow, Mrs. Constance ..... 100
Campbell, Mr. Frank ..... $100
Campbell, Mrs. Thelma ..... 100
Cantelon, Mr. & Mrs. John ..... 100
Carleton, Mrs. Janet L. ..... 100
Chan, Dwight ..... 200
Chen, Mr. Hua An ..... 200
Cheung, Kee Sun ..... 325
Choi, Sun Wing Tai ..... 500
Chomack, Mr. Mike ..... 200
Chow, Miss Annie ..... 100
Christie, Mrs. Kathleen ..... 100
Chung, Mrs. Grace ..... 1,000
Ciccozzi, Margaret ..... 200
Clark, Mr. & Mrs. Sidney ..... 100
Clark, Mrs. Margaret ..... 500
Clark, Mrs. Patricia ..... 100
Clayton, Mr. Leslie ..... 100
Cobrin, Yvonne ..... 150
Coggin, Mary ..... 2,200
Coghill-Thorne, Joy ..... 100
Colborne, Ms. Isabelle ..... 1,245
Coleman, Dr. Gerald U. ..... 500
Coles, Mrs. Anna ..... 100
Coles, Mr. J.A. ..... 1,000
Collins, Mark & Phae ..... 5,000
Compston, Dennis M. ..... 100
Connelly, Mr. Ronald ..... 100
Connop, Violet ..... 500
Conover, Col. R.O. ..... 100
Cosman, Leslie ..... 100
Cox, Mrs. Tove ..... 150
Cox, Mary O. ..... 100
Coy, Dr. Peter ..... 100
Craig, Mr. Graham ..... 100
Cumming, Miss Jean ..... 400
Cunningham, Norma ..... 200
Currie, Mr. Allan G. ..... 4,500
Currie, Mr. John R. ..... 13,950
Cusano, Mrs. Angela ..... 133
Cusson, Jean M. ..... 100
Dafoe, Mrs. E. ..... 200
Dafoe, Mr. Richard ..... 200
Dandurand, Mr. Leo ..... 100
Davidson, G. & T. ..... 500
Davidson, Gladys ..... 500
Davis, Mr. William ..... 100
Davis, Mr. Leslie ..... 100
De Haan, Mr. & Mrs. Pete ..... 100
Dean, Earl J. ..... 100
Decaire, Mr. Ray ..... 150
Decorte, Mrs. Faith ..... 100
Denhaan, Mr. Bert ..... 100
Dennis, Mrs. Marjorie ..... 100
Dennison, Lorna ..... 200
Devlin, Major Edward Gordon ..... 1,000
Dineen, Edgerton L. ..... 300
Dingle, H.H. ..... 100
Dmytryshyn, Ms. Joan ..... 100
Dmytryshyn, Mr. John ..... 150
Dossett, Edward J. ..... 200
Douglas, Gordon C. ..... 200
Downey, Mrs. Joan ..... 100
Dunbar, Joan & Al ..... 100
Duncan, Clarice ..... 400
Dunham, Dorothy ..... 200
Dunham, Mr. Vernon ..... 100
Dusman, Mr. Luigi ..... 200
Dyck, Mrs. Elizabeth ..... 409
Edward, I.M. ..... 100
Edwards, Mr. Harley ..... $1,000
Edwards, Ms. Frances ..... 100
Elliott, Mr. & Mrs. Alfred ..... 100
Ellis, Mr. & Mrs. Bryan ..... 100
Erskine, Mrs. Audrey M. ..... 5,000
Etches, R.M. & V.V. ..... 500
Evans, Dr. Adele M. ..... 900
Ewert, Mr. Peter ..... 100
Faiola, Ms. Maria g. ..... 500
Farina, Mr. M. ..... 100
Farley, D.J. ..... 100
Fehr, Abraham ..... 300
Fisher, Grace M. ..... 100
Fisher, Richard J. ..... 100
Fisher, Mr. John ..... 200
Fjordbotten, Mrs. Edna ..... 200
Fontaine, Ron & Louise ..... 100
Ford, Janet Vosburg ..... 1,000
Ford-King, A. ..... 100
Foreman, Jean ..... 100
Foreman, Barbara D. ..... 100
Fortin, Dan & Jeri ..... 100
Forward, Gordon E. ..... 100
Foster, Mrs. Betty ..... 100
Fouks, Arthur ..... 100
Fox, Warren ..... 100
Frazer, Mr. Frank ..... 100
Freeman, M. Joan ..... 200
French, Thelma ..... 200
Freybe, Ulrich & Ruth ..... 500
Froese, Mrs. Irma ..... 100
Gaube, Mrs. Hannah ..... 150
Gauthier, Laurie-Ann ..... 100
Gentz, Carl & Gerda ..... 5,000
Gibson, Ms. Constance ..... 200
Gilbert, Dr. Brad R. ..... 100
Gillott, Fred ..... 400
Glasser, Emanuel ..... 100
Golden, Sid ..... 100
Goldie, D.M.M. ..... 200
Goossen, Mrs. Vivian ..... 100
Gorchynski, Orest & Sonia ..... 100
Goshulak, Dora D. ..... 100
Gracia, Fernando ..... 100
Graham, B.L. ..... 500
Grant, David & Joan ..... 1,000
Grant, Jean ..... 200
Gravel, Miss Monique ..... 100
Greef, Miss Ivy ..... 100
Greengrass, Mrs. Anne ..... 300
Griffiths, Mr. James ..... 100
Groberman, Alfred ..... 500
Groves, Ms. Myrtle ..... 100
Grundmann, Jean P. ..... 200
Gurmit, Purewal ..... 100
Guttormsson, Kris & Alice ..... 100
Hagman, Mr. Carl ..... 100
Hall, John E. ..... 100
Hall, Barry ..... 100
Hall, Mrs. Joan ..... 100
Hallett, Mr. W.B. ..... 100
Hamel, Mr. Charles ..... 100
Hamilton, Patricia M. ..... 100
Hanbury, Mrs. Norma ..... 100
Hanson, Brenda ..... 375
Hanson, Mr. & Mrs. Fred ..... 150
Hardman, Mr. Gerald ..... 500
Hart, Herbert T. ..... 100
Hashka, Sarah ..... 1,000
Hassan, M.A. ..... $100
Hastings, Margaret ..... 100
Hausberg, Mr. Dedtrok ..... 100
Hay, Colonel Ian ..... 250
Haynes, Mr. William ..... 1,000
Helgason, W.R. & H.M. ..... 200
Helmcken, Mr. & Mrs. James ..... 100
Helmers, Mr. Jack ..... 100
Henderson, Mr. Gordon ..... 200
Hennessy, Bill ..... 160
Herman, Bud ..... 100
Herzog, Len & Jessie ..... 100
Hiele, Mr. Ben ..... 200
Hinkson, Mr. E. ..... 250
Hoffmeister, Amber ..... 150
Holman, Mike & Bev ..... 250
Holme, Mrs. Louise ..... 100
Hooker, Charles ..... 1,000
Hooper, Mrs. Joyce ..... 150
Horodney, Margaret ..... 100
Horton, Marguerite ..... 100
Hougham, Mr. Dennis ..... 100
Houston, Flo ..... 100
Hoyer, Ellen ..... 550
Huish, Betty ..... 100
Hunger, Mr. Herman ..... 100
Hungerford, Mrs. F. Mary ..... 200
Hurl, Ms. Donalda B. ..... 100
Hynninen, Leena ..... 300
Irving, Miss Mary ..... 100
Istad, Mrs. Kate ..... 100
Jack, Mr. William ..... 100
Jacobs, Mr. Raymond ..... 100
Jansen-Smits, M.A. ..... 400
Jeanes, Mrs. Viola ..... 500
Jennings, David C. ..... 100
Johnson, Mr.& Mrs.GoodwinW. ..... 100
Johnson, Randy & Sheila ..... 328
Johnson, Mrs. Gertrude ..... 100
Johnston, Mr. Wilfred ..... 100
Jones, Raymond ..... 100
Jones, Margaret ..... 150
Jones, Gordon ..... 100
Jory, Mrs. Mary ..... 100
Kabyn, Mr. George ..... 100
Kacan, Sandy ..... 1,000
Kalef, Ralph R. ..... 100
Kanders, Karline ..... 100
Kaye, Mrs. Barbara ..... 100
Keatinge, G.A. ..... 2,000
Keegan, John R. ..... 100
Keill, Mr. W/C Robert T. ..... 100
Keich, Mr. Gerd ..... 100
Kellett, Mr. George ..... 100
Kellington, Mrs. Sheelagh H. ..... 300
Kelly, Mike ..... 520
Kelly, Hon. William M. ..... 100
Kennedy, Ms. Margaret ..... 300
Kerr, Mary ..... 1,000
Kidd, Raymond K. ..... 100
King, David ..... 500
King, Ken & Maria ..... 100
King, Ms. Ella ..... 485
Kinloch, H. & C. ..... 500
Kitching, George ..... 100
Klingbeil, Glen & June ..... 125
Klishan, Miss Rita ..... 250
Koehler, Horst ..... 100
Koenig, Hans & Barbara ..... 500

| | |
|---|---|
| Kostashuk, Dr. Ed | $250 |
| Kovish, Ms. Josephine | 100 |
| Lai, Wai-Hing | 100 |
| Lakatos, Mr. E. | 100 |
| Lambert, Allen T. | 100 |
| Langergraber, Mr. Leo | 100 |
| Langley, Mrs. Margaret | 100 |
| Larsen, John | 120 |
| Laustrup, Mrs. Diana | 100 |
| Lawrence, Matilda | 100 |
| Lawrie, James B. | 100 |
| Learman, Emily M. | 100 |
| Leckie, Mr. Robert | 250 |
| Lee, Victor | 140 |
| Lee, Mrs. M.O. | 250 |
| Legg, Hugh | 200 |
| Leonidas, Mrs. Mary | 500 |
| Lerose, Mrs. Velia | 100 |
| Leung, Tin Wing Ed | 120 |
| Lewis, Mrs. Janet | 100 |
| Li, Mr. Gilbert | 200 |
| Lichtenfeld, Mr. Joseph | 100 |
| Lind, Mrs. Helen | 100 |
| Linwood, Ms. Gladys | 100 |
| Little, Mr. & Mrs. W.C. | 200 |
| Lo, Mr. Jim | 200 |
| Lock, Helen | 250 |
| Loewen, Mrs. G.E. | 100 |
| Logan, Brad J. | 500 |
| Long, Mr. Arthur | 500 |
| Lucas, Kirk | 140 |
| Lum, Mr. Danny Y.H. | 300 |
| Lum, Ms. Lilian | 100 |
| Lunden, Mr. Gordon | 150 |
| Lycett, Ms. Doreen | 150 |
| Lynn, Ms. Estelle | 500 |
| Ma, Sen Wen | 1,041 |
| MacDonald, Angus & Jean | 100 |
| MacDougall, John | 100 |
| Machin, E. | 100 |
| Machin, A.W. & C.E. | 100 |
| MacIntosh, Mr. Robert | 100 |
| MacKay, Frank & Agnes | 1,000 |
| MacKay, Colin B. | 800 |
| MacKenzie, John | 100 |
| MacKenzie, Harry & Jessie | 100 |
| MacKenzie, Dr. James | 100 |
| MacLean, Victor | 1,395 |
| MacLennan, D.E. & Gwen | 300 |
| Madden, Mrs. Kathleen M. | 500 |
| Madeiros, Mr. Alfredo | 300 |
| Magus, Mr. Peter | 100 |
| Mah, Mrs. Bella | 200 |
| Mah, Dr. Trudabeth | 500 |
| Mahee, Mr. Fakir | 100 |
| Mair, Dr. C.M. | 200 |
| Malcolm, Mr. James | 100 |
| Mandziuk, Mr. George | 100 |
| Manning, Betty | 100 |
| Mapson, Mr. Herbert | 100 |
| Mara, Miss Denise | 100 |
| Mara, Mr. John | 100 |
| Marcos, Dr. M. | 100 |
| Margetts, Mrs. Doreen M. | 100 |
| Marks, Sumiko | 250 |
| Marshall, J. Gordon | 500 |
| Marsland, Mrs. Gene | 100 |
| Martens, Mr. Jacob | 100 |
| Matcham, Pearl E. | 100 |
| May, Albert | 100 |
| McAlpine, Mr. John | 100 |
| McClintock, Lily | 100 |
| McCoy, Anna | 250 |
| McDonald, Ann N. | 630 |
| McDonald, Mr. W. Kyle | $630 |
| McEachern, Mr. Ronald | 100 |
| McGavin, Mr. & Mrs. Brian | 100 |
| McIlwain, Mrs. Phyllis | 200 |
| McInnes, Mrs. Florence | 100 |
| McInnis, Mrs. Margaret | 100 |
| McKay, Elizabeth | 150 |
| McKenna, Sadie K. | 100 |
| McLachlan, Mrs. Catherine | 100 |
| McLachlan, Ms. Isobel | 500 |
| McMahon E. Michael | 250 |
| McMaster, G. | 100 |
| McMillan, Archie & Shirley | 200 |
| McPhee, Michael | 100 |
| McRae, Harold & Edna | 100 |
| McRobb, Evelyn | 100 |
| Medland, C.E. | 205 |
| Mehra, Ravindra N. | 100 |
| Meilicke, Ms. Wilhelmine | 100 |
| Melnyk, Mr. Edward | 100 |
| Micatovich, Bill | 400 |
| Miki, Dr. Pat | 100 |
| Miles-Pickup, Mr. Arnold E. | 100 |
| Millar, Mr. Glenn | 100 |
| Miller, Mrs. Violet | 1,000 |
| Mirao, Luisa | 100 |
| Mitchell, Keith & Mary | 250 |
| Mitchell, Mr. A. Keith | 100 |
| Mitchell, Mrs. Eleanor May | 100 |
| Mitchell, Mr. George | 300 |
| Molcak, Mrs. Ruth | 100 |
| Molson, Ada | 200 |
| Moore, Mr. Ernest | 100 |
| Moore, Dr. Fred | 100 |
| Moorhouse, Mr. Brian | 100 |
| Morgan, Mr. Hjalmar Dave | 100 |
| Morrell, Mrs. Esther | 100 |
| Morrison, Nadia & Murray | 200 |
| Moses, C.R. | 100 |
| Mott, Lawson | 1,000 |
| Mouat, Mrs. Isabella | 200 |
| Muir, W. Keith | 100 |
| Murray, Mr. Donald | 200 |
| Murray, Mr. W. David | 100 |
| Myles, Mr. Ronald | 100 |
| Nagai, S. | 300 |
| Nakamura, Mrs. Ruth | 500 |
| Nataros, Dr. H.S. | 100 |
| Neilson, Mr. James | 100 |
| Nichols, W. Kimball | 100 |
| Nicoll, Bruce | 1,400 |
| Nip, Esther | 100 |
| Nisbet, C. | 100 |
| Nygren, Mr. Ronald | 100 |
| Olafson, O.R. | 100 |
| Orr, Virginia | 127 |
| Oughtred, Mr. W.T. | 250 |
| Owens, Mrs. Catherine | 100 |
| Painter, L.J. & Gladys | 100 |
| Papau, David W. | 200 |
| Parr, Miss Louise | 100 |
| Patterson, Mr. Alan | 100 |
| Pawlitza, Vera R. | 500 |
| Peckinpaugh, Mr. Douglas | 100 |
| Pekrul, Mrs. Margaret | 100 |
| Pelzer, Mr. William | 100 |
| Peoples, Mr. George A. | 100 |
| Pepper, Corinne | 160 |
| Perkins, Ms. Sheila | 4,500 |
| Perry, Ms. Rose | 275 |
| Petersen, Miss Phyllis | 200 |
| Phillips, Mrs. Edith L. | 100 |
| Piggott, W.R. | 100 |
| Piggott, Euphemia G. | 100 |
| Pike, Mr. & Mrs. James | $100 |
| Pike, J.A. & I.G.A. | 100 |
| Pinnell, Ms. E. Patricia | 125 |
| Pitalwala, Mrs. P. | 241 |
| Pitts, Mr. John | 1,000 |
| Plenderleith, Ian | 100 |
| Poehlke, Mr. & Mrs. H. | 200 |
| Poehlke, Mr. R. | 1,000 |
| Pollock, Mr. J.A. | 100 |
| Poole, Mr. Edward | 100 |
| Popoff, Mrs. Anne | 100 |
| Powell, Robert & Cindy | 175 |
| Pratt, Mr. & Mrs. Frederick H. | 200 |
| Preston, Mr. John C. | 100 |
| Prior, Mr. Trevor | 100 |
| Quon, Mr. & Mrs. F.K. | 100 |
| Quon, Sherman | 995 |
| Ramsay, Ms. Josephine | 100 |
| Ranger, Ms. Grace | 300 |
| Read, Ms. Christina | 100 |
| Redahl, Miss Shirley | 100 |
| Reddy, Dr. Suseela | 100 |
| Retallack, Dr. James | 100 |
| Revelant, Luigia | 100 |
| Reynolds, Mr. Arthur | 100 |
| Richards, Dr. Robert | 100 |
| Richardson Inc., J. Henry | 100 |
| Ritchie, Mr. Alex C. | 100 |
| Roadburg, George & Sally | 500 |
| Roberge, Mr. Hector | 100 |
| Robertson, Mr. Frank A. | 100 |
| Robinson, William G. | 1,800 |
| Rogers, Miss Betty | 100 |
| Rose, J. & P. | 100 |
| Rose, Mr. J. | 250 |
| Ross, Mr. David | 100 |
| Roy, Mrs. Georges | 100 |
| Royal, Ms. Marjorie | 100 |
| Russell, Mrs. Daisy | 100 |
| Rust, Tom G. | 100 |
| Rutherford, Dr. Alex | 100 |
| Sangara, Harjeet | 100 |
| Sangha, Mrs. Jangir | 100 |
| Santori, Mrs. Margaret | 100 |
| Sauder, Mary A.C. | 154 |
| Savenye, Mr. Fred | 100 |
| Sawyer, Mrs. & Mrs. Lloyd | 200 |
| Scarr, Mrs. Janette | 100 |
| Schaefer, Al & Jewel | 120 |
| Schlieper, Mr. Eric | 100 |
| Schramm, R.G. | 500 |
| Schultz, I. & W. | 100 |
| Seifner, Mr. Paul | 1,000 |
| Senaiko, Mr. Stephen | 150 |
| Serediuk, Mr. George | 100 |
| Shannon, Mary | 250 |
| Shortreed, W.R. | 100 |
| Skelton, Mrs. Doris K. | 3,100 |
| Slark, Mr. Gordon | 100 |
| Sloman, Mrs. Dors | 100 |
| Smith, Mr. Raymond | 1,000 |
| Smith, Mrs. Robert C. | 200 |
| Smith, Bill & Tina | 500 |
| Smith, Mr. T.C. | 100 |
| Southam, Mr. & Mrs. Gordon T. | 500 |
| Southam, Mrs. Jean | 1,000 |
| Spankie, Mrs. Mary | 200 |
| Speckman, Mr. George | 100 |
| Spence, Lindsay | 150 |
| Spence, Mrs. Elsie | 100 |
| Spilsbury, Mrs. Winnifred H. | 150 |
| Spilsbury, Mr. Ashton J. | 150 |
| Spooner, Jim | 400 |
| Springer, Mr. Charles | 100 |
| Standal, Irene | $8,750 |
| Standal, Mrs. Georgina | 2,300 |
| Stefiuk, Sharon A. | 100 |
| Stein, Mr. Karl | 1,000 |
| Sterling, Mr. Robert | 100 |
| Stevens, Barbara A. | 200 |
| Stevenson, Mrs. Shirley | 100 |
| Steward, Mr. Oswald J. | 500 |
| Stewart, W.R. | 100 |
| Stewart, Mr. Robert | 100 |
| Stewart, Ms. Della J. | 500 |
| Stone, Mrs. Darlene | 100 |
| Strang, Dorothy & R.F. | 250 |
| Stuart, Elizabeth R. | 100 |
| Suddard, Gladys M. | 100 |
| Suessmaier, Mr. Siegfried | 200 |
| Sung, Miss Lily K.S. | 1,900 |
| Surine, Mrs. H. | 125 |
| Swabb, Mr. & Mrs. William | 500 |
| Sykes, Katherine M. | 100 |
| Taggart, Valerie | 250 |
| Takkar, Sumitran | 100 |
| Tateyama, Julie K. | 100 |
| Taylor, Jack Andrew | 4,500 |
| Taylor, James | 500 |
| Taylor, H. | 100 |
| Taylor Mrs. Mary | 100 |
| Teodoro, Mrs. Regina A. | 210 |
| Thodford McDonald, Mary | 100 |
| Thompson, John R. | 100 |
| Thompson, Mrs. M. | 100 |
| Threlfall, Mr. George | 100 |
| Timbers, L. | 500 |
| Tollardo, Mrs. Emelie | 200 |
| Toop, Mr. & Mrs. R. | 100 |
| Torsnes, Mrs. Winnifred J. | 1,000 |
| Towle, Zoe & Dave | 100 |
| Trifaux, Mr. Rene | 100 |
| Tripp, Mr. Grant A. | 600 |
| Tsui, Margaret | 100 |
| Tudhope, Mr. Neil | 100 |
| Turpin, James F. | 100 |
| Twiddy, Mrs. Helen G. | 750 |
| Tyre, Martin & Donna | 150 |
| Ulrich, Mrs. R.L. | 100 |
| Underhill, Richard | 100 |
| Vallee, Mr. Bernard | 100 |
| van Der Vliet, Helen | 1,000 |
| van Roggen, George C. | 100 |
| van Slatte, Mr. Philip | 500 |
| Vanderzwan, Mr. Gysbertus | 100 |
| Vanin, Luisa | 100 |
| Vaughan. Jack & Jane | 100 |
| Verkerk, K. | 100 |
| Vernon, James H. | 100 |
| Walczak, Frank & Deanna | 2,000 |
| Walker, Mrs. Agnes M. | 500 |
| Wallace, Mr. William T. | 100 |
| Wallace, W.M. | 400 |
| Ward, Mrs. Kathleen | 300 |
| Warde, Mr. Murray | 100 |
| Wasilieff, Mr. Albert | 500 |
| Watson, Donald | 100 |
| Watt, Ms. Judith | 300 |
| Watters, J.I. | 100 |
| Watts, Greg & Louise | 100 |
| Weaver, Eileen | 100 |
| Welch, Mrs. Dorothy | 200 |
| West, Edith H. | 2,500 |
| West, Mr. Emile | 100 |
| White, Mr. Cecil | 100 |
| Whittall, Mr. H. Richard | 100 |
| Whittall, Mr. Richard | 200 |
| Whitton, Mr. Richard | 100 |

| | |
|---|---|
| Wilkinson, F. Camerson | $100 |
| Windsor, Mr. John | 200 |
| Winskill, Aileen | 1,100 |
| Wolfe, Dr. Blair | 500 |
| Woodward, Hazel M. | 2,800 |
| Woolley, Mr. Charles | 100 |
| Wotherspoon, R.B. | 200 |
| Wright Mr. Frederick | 100 |
| Wu, Mr. Hing | 100 |
| Yeomans, Mr. Frederick | 100 |
| Yer-Schulte, Brenninkme | 300 |
| Yoshida, Ms. Christine | 100 |
| Young, Mrs. H.D. | 100 |
| Yu, Nichols | 600 |
| Zimmerman, Adam H. | 100 |

## ORGANIZATIONS AND CORPORATIONS

| | |
|---|---|
| Albright & Wilson Americas | 197 |
| Andrew Mahon Foundation | 800 |
| Anonymous | 150 |
| Armadale Co. Limited | 100 |
| Atlas Iron & Metals Ltd. | 300 |
| B.C. Bio-Medical Laboratories Ltd. | 295 |
| B.C. Fancy Sausage Co. Ltd. | 500 |
| B.C. Forestry Association | 100 |
| B.C. Hardwood Floor Co. Ltd. | 5,000 |
| B.C. Lottery Corp. | 119 |
| B.C. Prov. Aerie F.O. Eagles | 1,125 |
| B.C. Prov. Aux. F.O.E. Whalley/Surr | 32,436 |
| B.C. Society of Orthodontists | 100 |
| Baker Lovick Advertising | 100 |
| Bank of Montreal | 500 |
| Belmont Properties | 100 |
| Benwell-Atkins Employee Gift Fund | 100 |
| Beta Sigma Phi Preceptor Theta Chpt | 100 |
| Boyle-Midway Canada Ltd. | 100 |
| British Columbia Masonic Foundation | 200 |
| Broadway Properties Ltd. | 50,000 |
| Brown Bros. Ford | 100 |
| Bull, Housser & Tupper | 500 |
| C.B. Jamieson MD FRCS(C) Inc. | 100 |
| Cam-Net Communications Network Inc. | 500 |
| Canada Safeway Store #157 (Staff) | 100 |
| Canadian Cancer Society | 5,987 |
| Canadian Cancer Society | 200 |
| Canadian Forest Products Ltd. | 350 |
| Canadian Northern Shield | 250 |
| Cancer Control Unit-H.E.U. Loc 180 | 100 |
| Cdn. Airlines Int'l Employees Fund | 5,378 |
| Central Park Manor - Mgmt & Staff | 140 |
| Chaparral Steel | 100 |
| Chevron Canada Limited | 328 |
| Chief & Petty Officers' Veterans | 1,200 |
| Christie Brown & Co. | 100 |
| Christmas Family Ball Society | 100 |
| City of Vancouver | 575 |
| Commerce Undergraduate Society | 651 |
| Consolidated Silver Standard Mines | 200 |
| Corinthian Lodge 27 | 400 |
| Custom Blacktop Co. | $100 |
| D. McDonald Ltd. | 250 |
| Danard & Co. Livestock Ltd. | 100 |
| Davis & Company | 3,000 |
| Diver Magazine | 150 |
| Dr's Markey and Jackson | 100 |
| Dr. Wayne L. Cyr Medical Services | 1,000 |
| E.B. Peerless Ltd. | 200 |
| Edward H. Angel Society | 100 |
| Employees of Peach Arch Food Serv. | 166 |
| Employees of VGH Patient Escort | 140 |
| Export Sales Company Ltd. | 100 |
| Fanny's Fabrics (B.C.) Ltd. | 500 |
| Fed.Prog.Cons.Assoc.of Capilano | 100 |
| Fraser-Burrard Hospital Society | 100 |
| G.W. Nelson Enterprises Ltd. | 100 |
| General Foods Inc. | 100 |
| Genstar Development Company | 200 |
| Grand and Toy | 100 |
| Graymont Limited | 100 |
| Greater Victoria Hospital Society | 647 |
| Greer Shipping Ltd. | 200 |
| Greig, Anna Ruthven (Fund) | 1,080 |
| Gypse Domtar Gypsum | 100 |
| H.J.Barrath Mgnt. & Investments Ltd. | 5,000 |
| HCD Health Care Diaper Inc. | 250 |
| Helicopter Welders of Canada Ltd. | 200 |
| Helix Biotech Corporation | 1,092 |
| Hogarth, Madge (Fund) | 2,145 |
| Holt Renfrew & Co. Limited | 150 |
| Inland Natural Gas Co. Ltd. | 300 |
| Intercontinental Packers Ltd. | 100 |
| International Care Corporation | 500 |
| Iode Royal Bride Chapter | 810 |
| Iona Sewage Treatment Plant Staff | 101 |
| Jambor Family (Fund) | 31,404 |
| Johnston & McKinnon Demolitions | 100 |
| Jones Food Store Equipment Ltd. | 100 |
| Jordan, Gail & Storrow | 500 |
| Josco Holdings Ltd. | 20,000 |
| K.J. Preiswerck | 250 |
| Karo Design Resources | 200 |
| Kelly Douglas & Company, Limited | 100 |
| Kirk Mail & Atlas Comm. Print Staff | 162 |
| Koffman Foods | 200 |
| Koret Canada Inc. | 790 |
| L.D. Sullivan Incorporated | 100 |
| L.J. LeFohn Family Foundation | 125 |
| Leslie Wright & Rolfe Ltd. | 100 |
| Lilydale Co-operative Limited | 528 |
| Lord of the Isles Ladies Auxiliary | 100 |
| MacDonald, Dettwiler & Associates | 500 |
| MacMillan Bloedel Limited | 5,000 |
| Marine Drive Golf Club | 1,085 |
| Martlett Chapter Iode | 700 |
| Matsqui-Sumas-Abbotsford Gen.Hosp | 550 |
| Medical Records. Cancer Registry | 112 |
| Merck Frosst Canada Inc. | 100 |
| Miles Pharmaceuticals | 250 |
| Millar Western Industries Ltd. | 100 |
| Monarch Holdings Ltd. | 1,000 |
| Moore Business Forms & Systems | $300 |
| Mr.& Mrs. P.A.Woodward Foundation | 25,750 |
| Multicorp Holdings Inc. | 100 |
| Nalley's Canada Limited | 100 |
| Nelson Place Hotel | 113 |
| Norco Products Ltd. | 1,500 |
| Northern Dynasty Explorations Ltd. | 100 |
| Nucletron Corporation | 150 |
| O.N.I.G.A. | 250 |
| Order of the Amarath | 206 |
| Pan Pacific Development Corporation | 250 |
| PCL Packaging Limited | 100 |
| Phone-Poulenc Pharma Inc. | 1,000 |
| Pocklington Holdings Inc. | 100 |
| PQR Distributors Limited | 250 |
| Proactive Learning Consultants Ltd. | 100 |
| R.D. Penhall Ltd. | 100 |
| Rothmans Inc. | 5,000 |
| Radd Holdings Ltd. | 1,000 |
| Rathgeb Foundation | 100 |
| RCMP, Reg. Civil. & Pub. Serv. EE. Div. E | 199 |
| Reed Stenhouse | 200 |
| Refrigerative Supply | 200 |
| Richmond Lioness Club | 1,000 |
| RJH Employee Community Service Fund | 560 |
| Rogers Foods Ltd. | 100 |
| Rowntree Mackintosh Canada Inc. | 100 |
| Royal Can. Legion - L.A. - No. 172 | 161 |
| Royal Can. Legion - L.A. Branch 91 | 1000 |
| Royal Can. Legion - L.A. - Van East | 100 |
| Royal Can. Legion Esquimalt Dockyd | 200 |
| Royal Can. Legion Ladies Auxiliary | 100 |
| Royal Can. Legion-Britannia BR. #7 | 300 |
| Royal Jubilee Hospital Foundation | 100 |
| Royal LePage Charitable Fdn. | 500 |
| Save-On-Foods | 120 |
| Secure-A-Car | 100 |
| Sherlock's Prime Rib Restaurant | 100 |
| Sidney Pier Holdings Ltd. | 100 |
| Sperling School | 112 |
| St. Edmund's School | 2200 |
| Staff of Fibron & Westcoast Cyl | 400 |
| Strand Development Corp. | 250 |
| Sun-Sea Travel & Assoc. Inc. | 200 |
| Swiss Pastry Shop Ltd. | 100 |
| T.C.C. Bottling Ltd. | 100 |
| Technical Marketing Associates B.C. | 100 |
| Telephone Employees' Community Fund | 1,000 |
| The Gorge Road Hospital | 172 |
| Tom Yee Produce Inc. | 100 |
| United Way | 20,643 |
| Urowest Holdings Ltd. | 1,000 |
| Van. Elem. School Admin. Assoc. | 210 |
| Vancouver Business Forms Ltd. | 100 |
| Vancouver General Hospital | $102 |
| Vancouver School of Theology | 1,000 |
| Vancouver Schools Coordinators Assn. | 100 |
| Vanlin Holdings Ltd. | 2,000 |
| Victoria Gen. Hosp. Emp. (Serv. Fund) | 1734 |
| Victoria Ladies' Horseshoe Club | 100 |
| Victoria Welsh Society | 200 |
| Victoria Welsh Society Bingo | 300 |
| Washington International Horse Show | 100 |
| Weiser Inc. | 100 |
| Welbreck Holdings Ltd. | 250 |
| Westcan Terminals Ltd. | 100 |
| Western Forest Products Limited | 5,000 |
| Wild Leitz Canada Ltd. | 100 |
| Wood Gundy | 1000 |
| Woodwards Stores - Management Team | 110 |
| York House School | 250 |
| Total Donations under $100 | $102,794 |
| Total Donations, including fund-raising projects | $609,168 |

## B.C. Cancer Foundation Bequests From the Estate of the Late:

| | |
|---|---|
| Allinson, Jennie | $1,000 |
| Bannerman, Warren Stewart | 5,000 |
| Barrat, Dinah | 5,000 |
| Boucher, Lily Beatrice | 29,335 |
| Bowles, Violet | 500 |
| Brown, Marion Charlotte | 4,406 |
| Burtch, Doris Irene | 10,000 |
| Dalle, Clara T. | 16,213 |
| Diamond, David | 5,000 |
| Dickson, Evie | 2,132 |
| Donish, George | 5,000 |
| Eastwood, Laura | 1,000 |
| Eastwood, Willie | 1,000 |
| Edwards, Kate | 2,000 |
| Ford, Irene | 10,333 |
| Gladu, Flora | 1,000 |
| Hamber, Aldyen | 10,000 |
| Harvey, Gwladys, E.N. | 1,000 |
| Hayes, Leopold | 9,038 |
| Higgins, Maude Valeria | 24,945 |
| Holland, Lilly Pearl | 1,000 |
| Howl, Jane | 1,000 |
| Irwin, Maxine | 96,522 |
| Lightbody, Frederick C. | 99,006 |
| Little, Eleanor G. | 704 |
| McCarthy, Clara | 22,250 |
| McPherson, Sheila | 1,000 |
| Mainwaring, Lenora E. | $6,000 |
| Morgan, Florence V.E. | 5,537 |
| Norton, Gladys Nolene | 12,697 |
| Parker, Janet Gray | 10,827 |
| Richards, Russell J.G. | 250 |
| Ritchie, Rhea | 60,151 |
| Robertson, James | 53,828 |
| Sanderson, Irene | 200,000 |
| Siegel, Eleanor Eva | 7,483 |
| Singh, Harnam Kaur (Kor) | 10,000 |
| Slidders, Jane | 100 |
| Smyth, Emily Mary | 20,000 |
| Somolenko, Trephon (Thomas) | 32,260 |
| Stewart, Irene | 52,967 |
| Street, Peter John | 1,494 |
| Street, Robert | 100,000 |
| Trinder, Bessie | 20,000 |
| Tweedie, Edith (Memorial Fund) | 2,283 |
| Vince, Elizabeth Eva | 20,483 |
| Ward, Robert Almond | 2,979 |
| Williamson, Lillian A. | 3,000 |
| Weaver, Olive Diana | 41,500 |
| Adjustment prior year | (8,000) |
| **Total** | **$1,021,223** |

## B.C. Cancer Foundation Bequests designated for specific purposes: From the Estate of the Late:

| | |
|---|---|
| Adler, Frederick Jacob | $1,000 |
| Blyth, Dorothy Gladys | 75,000 |
| Brown, Esther Mae | 2,634,849 |
| Conroy, Charles | 23,831 |
| Hughes, Dorothy Maybelle | 5,000 |
| Laing, Leila Muriel | $1,000 |
| Royal Trust (for the Lavender Memorial Trust Fund) | 36,000 |
| Young, Iris Cowtan | 5,000 |
| **Total** | **$2,781,680** |